For greater yield in plant or field . . .

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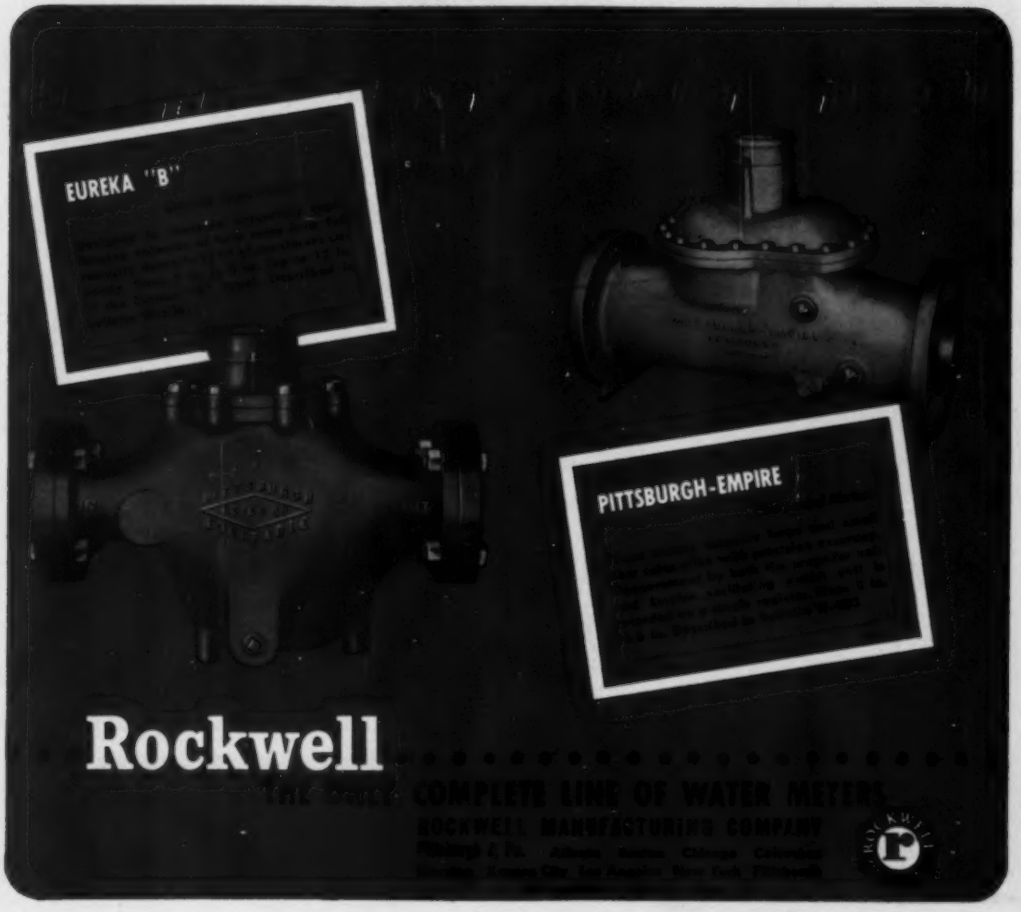
Big water meters are a major investment. Their true worth must be based on their revenue earning performance—their freedom from breakdowns and sticking—their economy to repair.

Cost-minded water works engineers specify big Rockwell meters because they will earn more revenue and yield more service per dollar invested. You'll find them simple, easy to repair, and constructed with typical Rockwell care from the finest materials obtainable.

Immediate deliveries can be made from warehouse stocks in most areas.



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"MEASURING THE WATER OF THE WORLD"

First for Accuracy • Low-Cost Maintenance • Durability • Sensitivity

BADGER *Water* METERS

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INDUSTRIAL WASTE TREATMENT

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THE MEMBERSHIP OF A DISTINGUISHED CLUB . . .

C.I.P. Century Club now has 38 Members

The Cast Iron Pipe Century Club is probably the most unusual club in the world. Membership is limited to municipal, or privately-owned, water and gas supply systems having cast iron mains in service for a century or more.

Although the Club is formally constituted, there are no dues, no regular meetings, and no obligations other than to inform the Recording Secretary if and when the qualifying water or gas main is taken out of service, or, sold for re-use.

In spite of the unique requirement for membership, the Club roster grows, year by year. And why not, when a survey sponsored by three water works associations, indicates that 96% of all 6-inch and larger cast iron water mains ever laid in 25 representative cities are still in service. And when answers to a questionnaire, mailed to gas officials in 43 large cities, show that *original* cast iron mains are still in service in 29 of the cities.

If your records show a cast iron main in service, laid a century or more ago, the Club invites you to send for a handsome framed Certificate of Honorary Membership. Address Thomas F. Wolfe, Recording Secretary, Cast Iron Pipe Century Club, Peoples Gas Bldg., Chicago 3, Illinois.

CAST IRON

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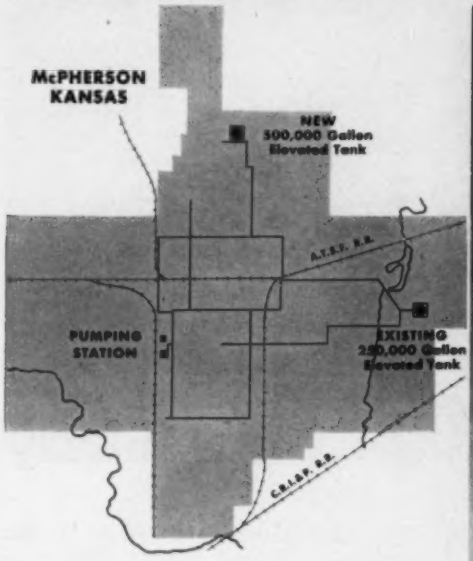
CAST IRON PIPE SERVES FOR CENTURIES

ANOTHER CITY LOOKS AHEAD
with HORTON Elevated Water Storage

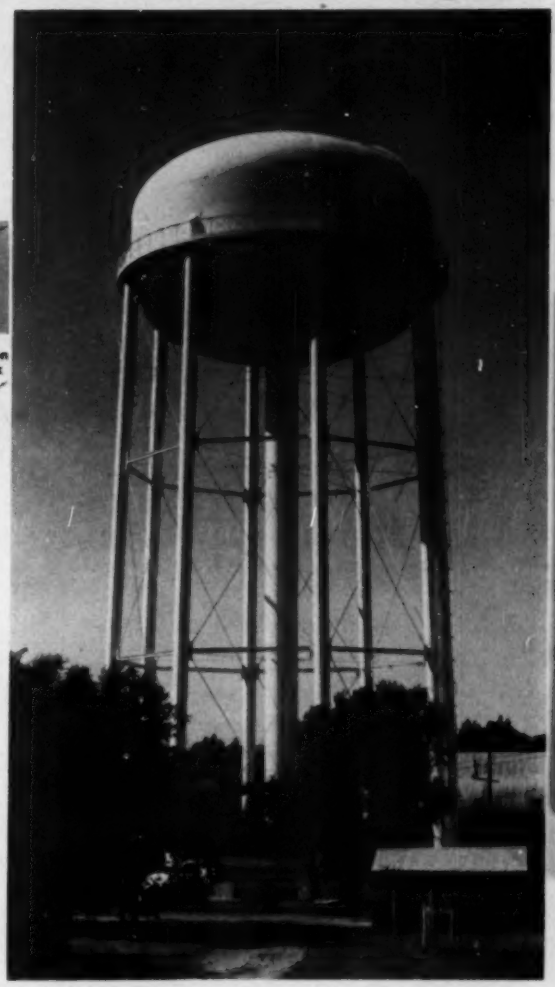


Extensive municipal improvements in McPherson, Kansas, recently included over 15,000 feet of water transmission lines and the modern 500,000-gallon Horton elevated water tank shown at the right. Both these important additions will have a favorable effect on the city's water service for many years to come.

In many instances, Horton elevated tanks have paid for themselves in a relatively short period of time by reducing pumping costs and improving customer satisfaction *throughout* the water system. Increased pressure often means increased consumption.

Horton elevated water tanks with ellipsoidal bottoms are built in capacities from 15,000 to 500,000 gallons. The radial-cone design is used for capacities from 500,000 gals. to 3,000,000 gals.

Plan for the future — Give your city the advantages of Horton elevated storage.



This 500,000-gallon Horton tank, 98 ft. to bottom, provides gravity water pressure in the distribution mains at McPherson, Kansas. It has a 30 ft. range in head between the upper and lower water levels.

HORTON

WELDED STEEL

STORAGE TANKS

CHICAGO BRIDGE & IRON COMPANY

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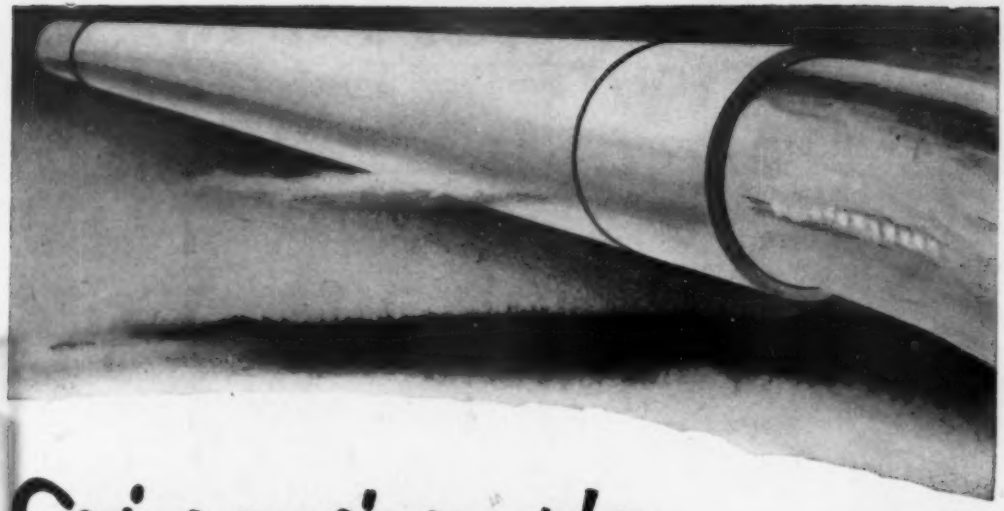


Saving precious water for a thirsty

Municipal consumption of water in the United States has risen from two billion to over twelve billion gallons per day in the last fifty years.

In many areas, this rapid increase is posing a serious problem. It means that water supplies must be conserved to the limit if they are to continue to meet an ever-growing demand.

It is not surprising, therefore, that more and more water-works officials are seeking ways to cut down on water losses as one practical step toward the solution of this problem.

Since recent studies indicate that many localities are losing as much as 10% of water pumped because of underground leakage, an important question to be answered in any water conservation program is this: "How can I plan to reduce this major cause of water loss to a minimum?"

Community after community has found the answer in Transite Pressure Pipe.

The unusual success of Transite Pipe in combatting underground water losses is due to a combination of two factors: (1) the design of the Simplex Coupling used for assembly, and (2) the ability of the pipe to maintain its strength in service.

Because flexibility is engineered into the Simplex Coupling, this factory-made joint is virtually unaffected by pipe line stresses that so often result in the loosening and failure of conventional type joints. No particular skill is required for its proper assembly, which is readily checked in the trench by means of a simple gauge immediately after the pipe ends are joined.

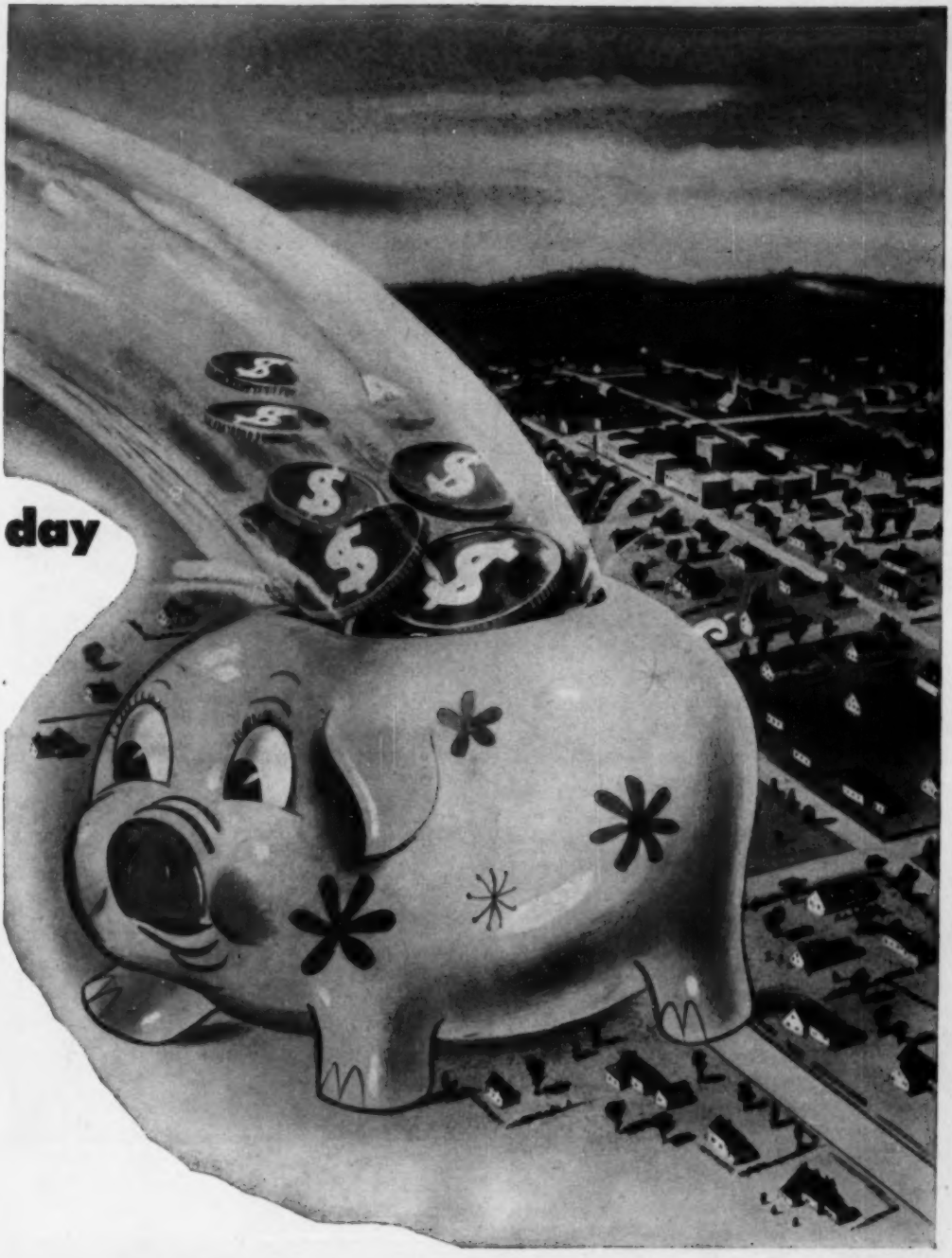
Moreover, Transite's maintained strength provides a further safeguard against costly underground water losses. In thousands of installations representing a wide variety of municipal soils, this asbestos-cement pipe has proved its exceptional ability to resist corrosion . . . to maintain its strength under conditions which have seriously impaired the structural integrity of other pipe materials.

Reducing the amount of "water pumped but not paid for" on your books—a saving in dollars as well as water—is only one of many important economies which Transite Pipe can offer you. Savings on installation, savings on pumping costs, savings on maintenance . . . these are further sound reasons why you will want all the facts about this modern asbestos-cement pipe developed and produced by Johns-Manville to carry water more efficiently.

For complete information write Johns-Manville, Box 290, New York 16, N.Y.

JOHNS-MANVILLE JM PRODUCTS

Johns-Manville



TRANSITE PRESSURE PIPE

Transite is a registered Johns-Manville trade mark

modernize—for greater capacity—economically with Rex Floctrol and Verti-Flo!

When increased demands exceed the capacity of your water treatment plant, you can bring your plant up-to-date . . . step up capacity . . . economically with **Rex Floctrols** and **Verti-Flo** Clarifiers. Installed in new or existing tanks, these efficient units provide greatly increased capacities . . . more effective results.

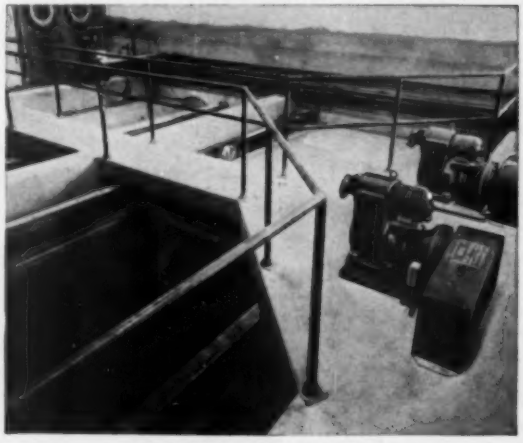
At the Fairmont, Minn., treatment plant for example, **Rex Floctrols,** installed in modernized tanks, and a **Verti-Flo** in an existing tank, made possible an increase in plant capacity from the originally designed capacity of 500,000 G.P.D. to 2,000,000 G.P.D. *without increasing the physical size of the plant.*

Tests show that the chemical reaction is complete within the Floctrol despite the extreme seasonal changes in water temperature.

The **Verti-Flo** equipment was installed in two existing rectangular settling tanks, providing for and efficiently handling 2,000,000 gallons daily, an increase of 1,500,000 gallons daily over the original designed capacity of the two conventional tanks. Detention time was reduced from 6.2 hours to 1½ hours, and solid removals were remarkably improved. Effluents were improved to the point where filter runs were increased 5 to 6 times.

Why not reap the benefits of this modernization for your plant? For complete details and informative literature, write: **Chain Belt Company,** 1610 W. Bruce Street, Milwaukee 4, Wisconsin.

Rex Verti-Flo Clarifier at Fairmont, Minn.



Rex Floctrols at Fairmont, Minn.

CHAIN BELT REX COMPANY

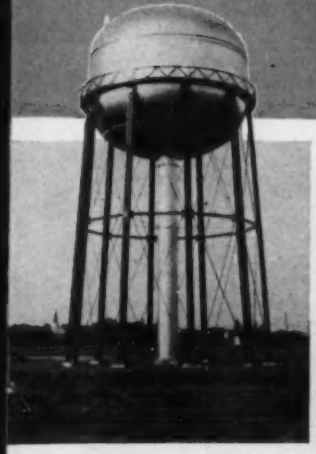
WATER TREATMENT EQUIPMENT

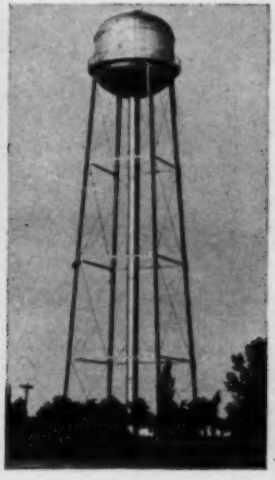
WHERE **Appearance** COMBINES WITH **Economy**

PITTSBURGH • DES MOINES

Double-Ellipsoidal Elevated Steel Tanks

Over a wide range of capacities up to a million gallons, the Pittsburgh-Des Moines Double-Ellipsoidal design offers low investment cost, excellent appearance and economical performance. It is one of the several P-DM Elevated Steel Tank types, meeting every water storage requirement.





Write for your free copy of our latest 24-page brochure, detailing many important aspects of modern water storage.

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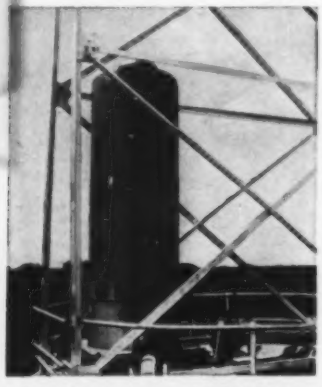
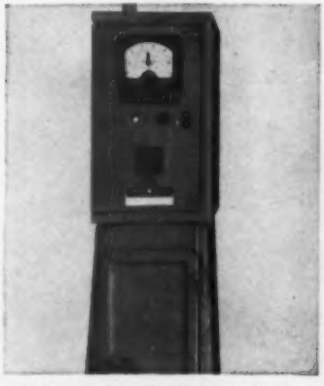
SEATTLE.....926 Lane Street
SANTA CLARA, CAL.....625 Alviso Road

WACO ADOPTS NEW

Requirements of Waco's water system are 15 mgd or 10,000 gpm. The new G-E MACA pump drive which enables operator to maintain this constant flow is mounted on surge tank at far right. Other buildings are filter plant at left, and pump house, right. Water is carried underground from Lake Waco and the Brazos River.



Infinite-step speed range of G-E MACA drive motor is 675–540 rpm with corresponding output range of 200–160 hp. The 2300-volt motor is designed for heavy-duty service.



Speed is controlled from this station. Operator notes flow on indicating meter and adjusts motor speed. Operator's function can be handled automatically with added equipment.

Accelerating contactors and starting resistor for the MACA drive are housed in a secondary control cubicle. The contactors' function is to accelerate MACA motor to operating speed.

CO-ORDINATED WATER-PLANT ELECTRIFICATION

G-E DRIVE NOW...

FOR MORE WATER TOMORROW

Wide head variations overcome, constant flow maintained with new G-E adjustable-speed pump drive

Uniform efficiency over a wide speed range plus adjustable-speed in an infinite number of steps explain why the Board of Water Commissioners of Waco, Texas, and their consulting engineer chose the new General Electric MACA drive to help solve the city's water supply problems.

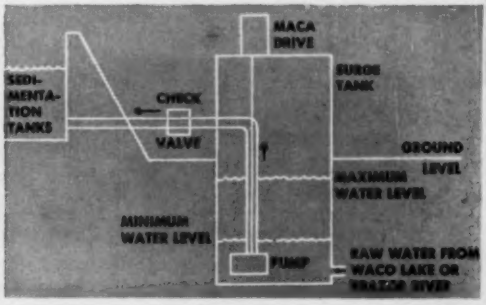
Water to be treated is taken from Lake Waco and the Brazos River. Unusual conditions cause considerable fluctuation of the water level in the plant's surge tank. Maintaining the necessary constant flow of 10,000 gpm under these conditions calls for an efficient pump drive whose speed can be readily adjusted to meet the radical head variations.

With the MACA adjustable-speed drive, the problem is met in this way: A meter indicates when a variation in flow occurs. The operator then selects the proper drive speed from the infinite number of speed steps available to bring the flow back to desired value.

Development of the MACA adjustable-speed drive stems from General Electric's experience in furnishing drives, power-distribution systems and process controls for water plants and many other industries. Out of this same background has come G-E co-ordinated water-plant equipment, noted for its reliability.

Find out more about MACA drive from your G-E representative. He can show you how this and other General Electric equipment, together with G-E application engineering means real teamwork in the modernization of your plant's electrical system. See him now. He can be of most help early in the planning stage. *General Electric Company, Schenectady 5, N. Y.*

MACA-drive primary control is located in the cubicle at the right, incorporated in the G-E Limitamp control panel for the treatment plant. When additional motors make more control space necessary, cubicles can be easily and quickly added.



The hydraulic, pumping and drive equipments are shown in this schematic diagram of the surge-tank area of the Waco Treatment Plant. Regardless of wide head variations in the raw-water sources, the MACA drive enables the operator to maintain constant flow of 10,000 gpm into the treating tanks.

666-62

GENERAL ELECTRIC

there's plenty in this SLEEVE

The new Fairbanks-Morse Pomona external sleeve bearing assembly gives you *plenty* of advantages in efficient, economical deep-well turbine pump performance.

This important advance in turbine pump bearing design assures maximum life of the bearing assembly without any sacrifice in line shaft streamlining and bowl efficiencies. The full-floating, spiral groove, rubber bearing assures efficient water lubrication. Bearing grooves provide continuous flow from end to end of the bearing . . . a positive flushing action that eliminates any possibility of destructive sand particles traveling across the full face of the bearing.

There is no chance for liquid entry between shaft and sleeve bearing. Friction and shaft bearing losses are reduced to the minimum. Worn sleeves can be easily and inexpensively replaced in the field.

This advanced development, plus the many other Pomona advantages, adds up to maximum efficiency . . . lowest operating and maintenance costs. Your branch pump engineer or Fairbanks-Morse Pomona Pump dealer will be happy to give you the complete story. Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago 5, Ill.

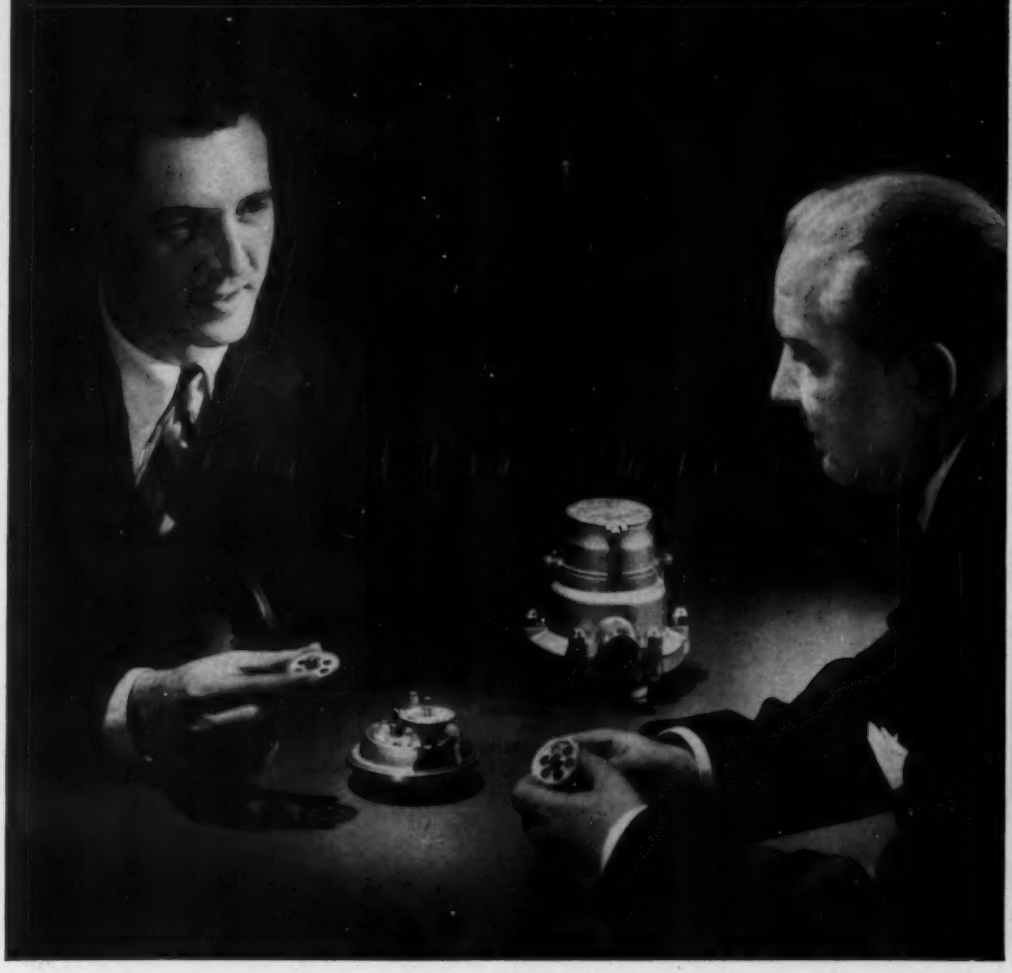
FAIRBANKS-MORSE,

a name worth remembering

PUMPS • SCALES • ELECTRIC MOTORS • GENERATORS
LIGHT PLANTS • DIESEL, DUAL FUEL AND GASOLINE ENGINES

SIMPLICITY of AMERICAN METERS

PERMITS FINEST QUALITY AT MODERATE COST



A residential water meter earns $200 to $500 revenue in its lifetime, so ability to earn full revenue is most important. In American Meters, quality and accuracy are unsurpassed. Initial cost is also kept moderate because of the unusually simple overall design.

American Meters have fewer parts, more simple castings than most. This permits the finest materials and workmanship to earn full revenue, without excessive cost.

Users obtain premium performance at competitive price.

BUFFALO METER CO.

2909 MAIN STREET, BUFFALO 14, NEW YORK

THIS TIME IT'S THE CITY OF NACOGDOCHES, TEXAS

Over in the prosperous pine timber and rich agricultural belt of east Texas, the city of Nacogdoches is looking to the future and planning for further growth. New industries locating at this excellent manufacturing and distribution point were in need of more water. To take care of such needs, municipal officials called in Layne and ordered the installation of another deep well and pump unit, —the third since 1925. With this new unit in operation, Nacogdoches now has a greater water supply capacity than is presently needed.

These three Layne installations extending back for more than a quarter century, have had every opportunity of failing,—or showing proof of their wonderful efficiency, extra long life and absolute dependability.

The answer was as usual with all Layne water supply equipment. Congratulations to Nacogdoches for continued use of the world's finest wells and pumps.

THE THREE LAYNE well water supply units installed for Nacogdoches, were designed, built and installed complete by Layne's own engineers, factory and field crews. All installations were under the rigidly controlled and extraordinarily successful Layne method. Each is staged for the exact requirements of the city's pressure specifications.

LAYNE & BOWLER, INC.

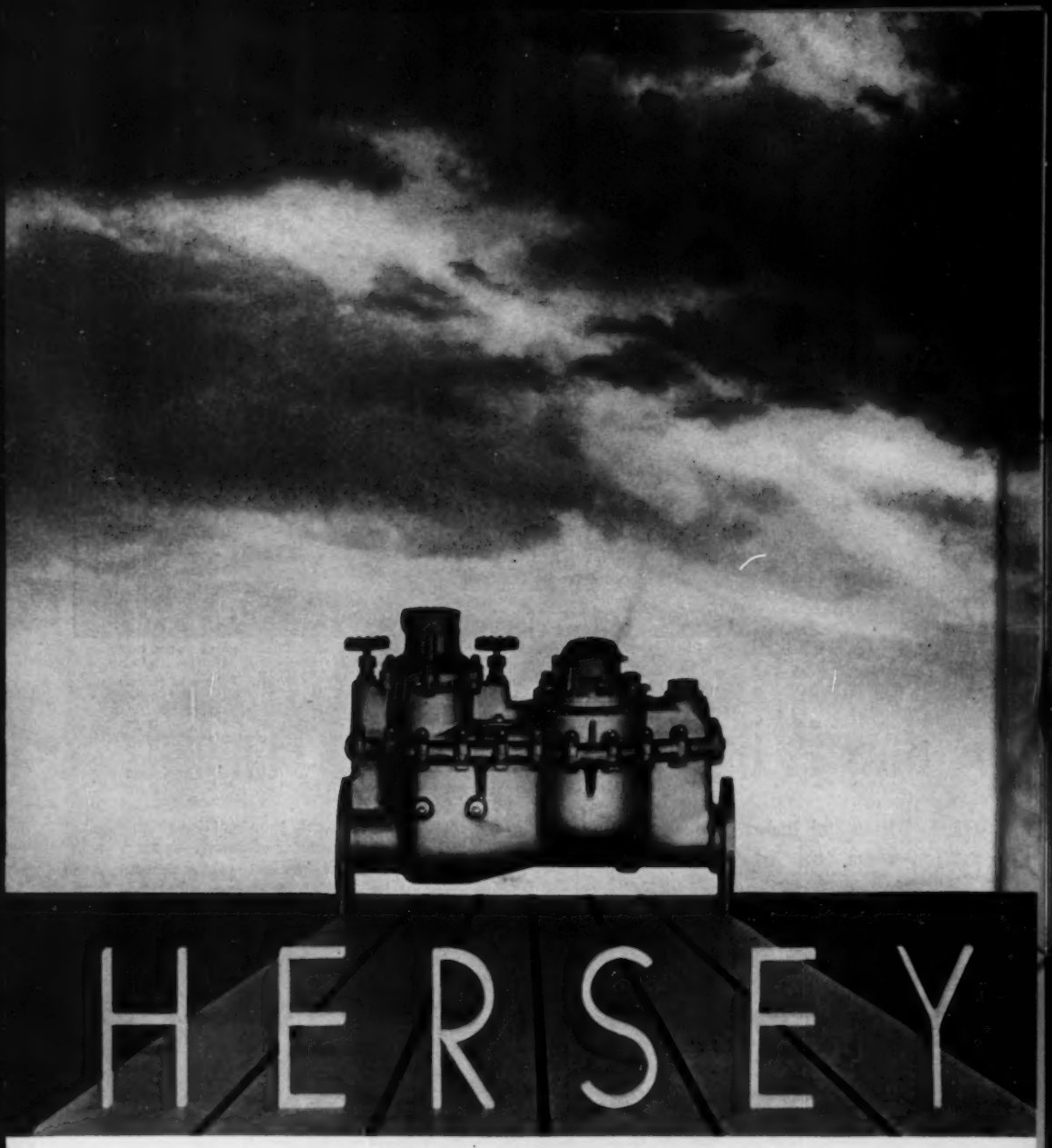
General Offices, Memphis 8, Tenn.

Designers, manufacturers and installation contractors of high efficiency, long life water supply wells and pumps for cities, industries and irrigation.

HELPFUL LITERATURE ON PUMPS

The line of Layne Short Coupled general service pumps is wide enough to include every size, capacity and setting to fulfill any need found in the municipal or industrial field. A new catalog, illustrated with diagrams of practical application of these pumps, will be sent on request.

Layne
WATER SUPPLY
WELLS & PUMPS



A COMPOUND METER

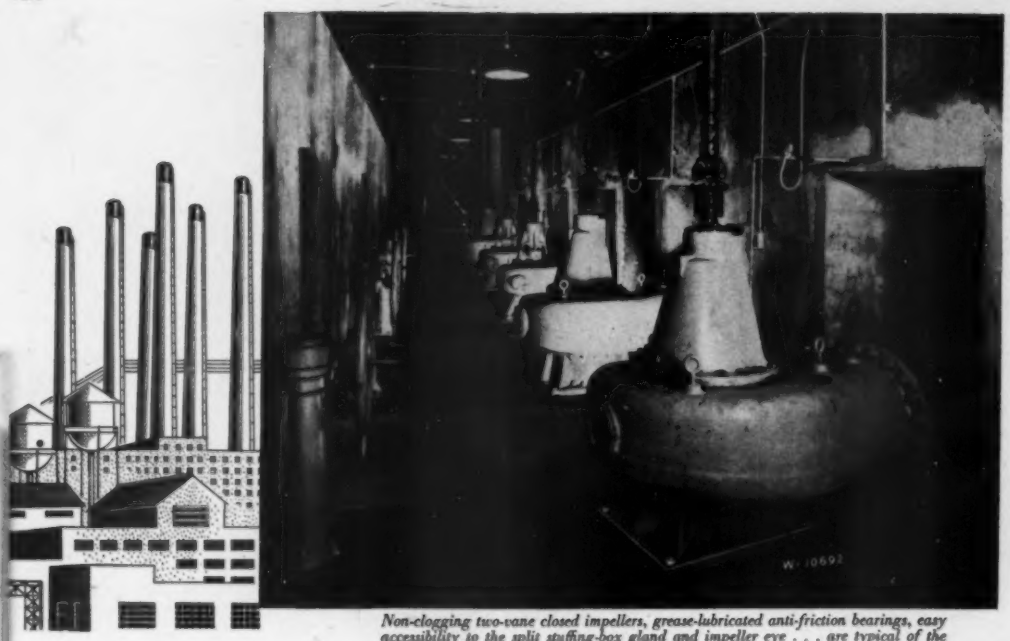
whose reputation for long life, accurate registration and low maintenance cost has been thoroughly demonstrated to the satisfaction of experienced water works engineers. This exclusively designed Compound Water Meter is made only by Hersey.

All bronze case from 2" to 6"

HERSEY MANUFACTURING COMPANY

SOUTH BOSTON, MASS.

BRANCH OFFICES: NEW YORK — PORTLAND, ORE. — PHILADELPHIA — ATLANTA — DALLAS — CHICAGO SAN FRANCISCO — LOS ANGELES



Non-clogging two-vane closed impellers, grease-lubricated anti-friction bearings, easy accessibility to the split stuffing-box gland and impeller eye . . . are typical of the many Worthington MIXFLO *features assuring low-cost, trouble-free sewage pumping.*

How is Bridgeport's Sewage Pumped?

It's full of industrial waste . . . a problem built for Worthington Pumps

Here's another municipality which has turned its sewage pumping over to Worthington—100%.

These five Worthington Vertical MIXFLO sewage pumps are located in Bridgeport's Westside sewage plant—installed in 1946. Three are 20-inch, two are 16-inch MIXFLOS.

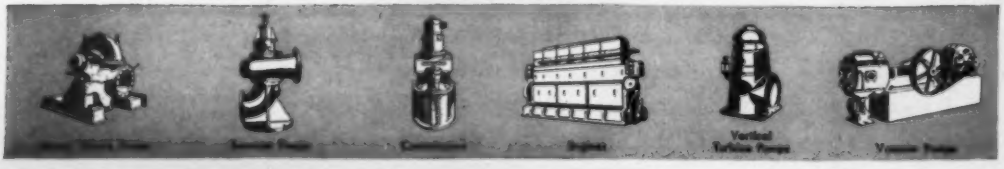
Bridgeport's Eastside plant duplicates these five pumps, and in addition uses two Worthington dry vacuum pumps and a Worthington air compressor.

In many other places, too, Worthington—world's largest manufacturer of pumps—is keeping pace with developments in sewage treatment and disposal by furnishing pumps of utmost dependability.

The Worthington MIXFLO line offers the industry's widest choice of sizes and types. So take a tip from New York, Chicago, Philadelphia, Bridgeport—find out why *there's more worth in Worthington*. Write Worthington Pump and Machinery Corporation, Public Works Division, Harrison, New Jersey.

WORTHINGTON

SEWAGE PUMPS W.13



MEDIA, PA.

Sewage Disposal Plant

(COMPLETED IN 1950)

GUSTAVE D. HOUTMAN
President of Council and Borough Engineer
MEDIA, PA.

EARL F. SNEAR
Supt. of Water and Sewers
MEDIA, PA.

View of chlorine house.

B-I-F Industries Equipment on the job!

BUILDERS *Visible Flow* CHLORINIZER

- **Model DV5X-M**
- **Manually Controlled**
- **Solution Feed**
- **Maximum Capacity 100# per 24 Hours**

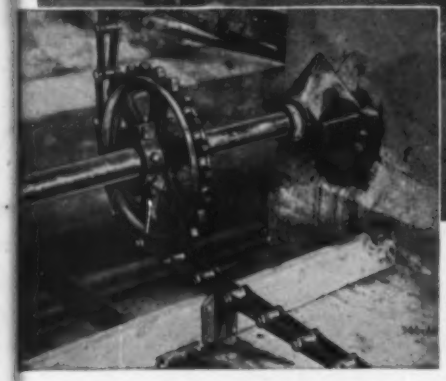
The treatment and disposal of sewage is a vital public health measure in any municipality, large or small. For the 7000 people living in and around Media, Pa., the recently completed Sewage Disposal Plant provides big-city sewage handling methods for this moderate sized community. The plant employs primary and secondary treatment, plus chlorination to treat an average daily load of 500,000 gallons.

Accurate chlorination of the effluent as it flows from the trickling filter to the final settling tanks is performed by a BUILDERS *Visible Flow* CHLORINIZER. Here, as in so many other sewage plants and water works throughout the country, the Chlorinizer is contributing important operational advantages due to its simplicity, safety, ease of operation, and durability. For complete information on Builders Water Works Equipment, address Builders-Providence, Inc. (Division of Builders Iron Foundry), Providence 1, Rhode Island.

B-I-F INDUSTRIES

BUILDERS-PROVIDENCE

BUILDERS



A "PERMALIFE" hunting tooth sprocket is shown in inset at left. Large view shows a group of Jeffrey Collectors all equipped with "PERMALIFE" Sprockets. Jeffrey FLOCTROLS on this job, also.

It's the SPROCKETS THAT MAKE THE DIFFERENCE

Jeffrey Sludge Collectors are different (and last longer) when equipped with our hunting tooth "PERMALIFE" Sprockets of unique design. The sprocket has an odd number of teeth (approximately 3" pitch)—one tooth moves forward at each revolution. Over any period of time the sprocket teeth get approximately one half the number of contacts with the chain barrels as in the case of regular 6" pitch sprockets.

This feature, together with Chainsaver Rims which support the side bars of the chain, WILL DOUBLE THE LIFE OF THE SPROCKETS. Investigate these IMPROVED Sprockets—made of alloy cast iron and chilled.

Send for Catalog No. 833

THE JEFFREY MANUFACTURING COMPANY Established 1877

996 North Fourth St., Columbus 16, Ohio

Complete Line of Material Handling, Processing and Mining Equipment

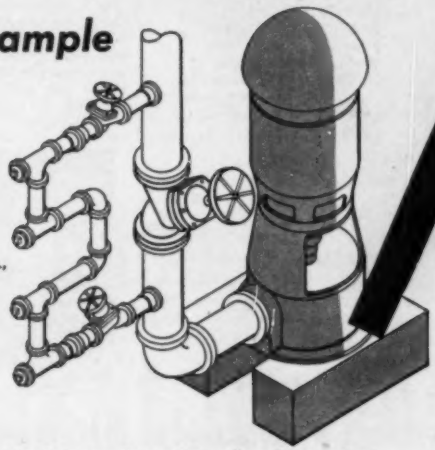
Baltimore 2 · Beckley, W. Va. · Birmingham 3 · Boston 16 · Buffalo 2 · Chicago 1 · Cincinnati 2 · Cleveland 15 · Denver 2 · Detroit 13 · Norton, Ky. · Houston 2 · Jacksonville 2 · Milwaukee 2 · New York 7 · Philadelphia 3 · Pittsburgh 22 · St. Louis 1 · Salt Lake City 1 · Scranton 3

Jeffrey Mfg. Co. Ltd., Montreal, Canada
Jeffrey-Galion (Pty.) Ltd., Johannesburg, S.A.
The Ohio Malleable Iron Co., Columbus, Ohio
British Jeffrey-Diamond Ltd., Wakefield, England
The Galion Iron Works & Mfg. Co., Galion, Ohio
The Kilbourne & Jacobs Mfg. Co., Columbus, Ohio

for outstanding service

on Corrosive Well Water

...for example



The Installation—
Barr Rubber Products Co.,
Sandusky, Ohio

PROBLEM: To eliminate costly seating and packing maintenance, and frequent replacement of valves on plant well-water pump. Valves previously used highly unsatisfactory, having maximum life of 6 months.

WORKING CONDITIONS: Sulphur content of water extremely high. Valve constantly exposed to severe corrosive and erosive effects. Operated infrequently; yet easy operation, positive seating are prime requisites.

SOLUTION TO PROBLEM: Crane Packless Iron Body Diaphragm Valves featuring separate disc and diaphragm design. Three-inch No. 1611 flanged end valve on main discharge; ¼-inch No. 1610 screwed end valves on by-pass.

RESULT: While other valves lasted only 6 months or less, Crane Diaphragm Valves show no effects of service, after more than a year. They operate smoothly . . . seat tightly . . . no maintenance whatsoever needed to date!

Another typical demonstration of superior quality, and the low-cost performance of Crane Valves. That's why . . . More CRANE VALVES are used than any other make!

...Choose Dependable CRANE VALVES

No. 1611 Crane Iron Body Diaphragm Valve —one of a full line suited for many services. Literature on request from your Crane Branch or Crane Wholesaler.

CRANE CO.

General Offices:
836 S. Michigan Ave., Chicago 5, Ill.
Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING

PROCESS ENGINEERS INCORPORATED

New Improved Equipment

• DEVELOPED
• DEMONSTRATED
• PROVEN

★ PROCESS CLARIFIERS

Numerous successful installations are the result of "know how" acquired by the personnel of Process Engineers Incorporated through many years of experience.

Type B. North Roseburg, Oregon. Diameter 30'. This construction has beams spanning the tank for supporting the rotating mechanism. Used for tanks up to 45' in diameter.

Type C. Banning, Calif. Diameter 45'. The drive unit and rotating mechanism supported on a steel or concrete center column that takes all of the torque.

Type T. Bellingham, Washington. Diameter of each tank 60'. Has a center column for supporting the rotating mechanism and driven by means of a driving walkway or truss with traction wheels rotating on the tank wall. The traction wheels are driven by a gear motor, sprockets and roller chain.

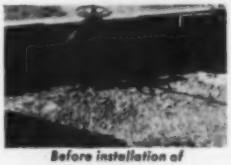
★ PROCESS OXIDATORS

Process Oxidators include aeration, coagulation and sedimentation in a single circular tank giving the results of intermediate treatment at practically the cost of primary treatment. Installation also results in minimum scum handling, higher removal of suspended solids and greater reduction in biochemical oxygen demand with improved clarification, increased grease removal and elimination of odors by maintaining sewage in fresh condition. The Oxidator is suited to processes involving chemical reactions and if followed by a biological filter, reduces the size of the filter because of a reduction in the BOD loading. Three types B, C, and T are available as in the case of the Process Clarifiers.

Type B, Gilroy, Calif. Dia. 45'.

Type T, Chula Vista, Calif. Dia. 55'.

★ PROCESS Automatic Variable Skimmer



Before installation of Process Skimmer

This device automatically skims floating material from the surface of a liquid that varies in elevation by several feet. The difference in elevation between the liquid level and the lip for skimmings is adjustable and will maintain this adjustment during the up and down travel. The device is sensitive within ¼" change in the liquid level.

After installation of Process Skimmer

★ PROCESS CLEANABLE SIGHT GLASS

A "must" for every sewage plant! Consists of a short section of special glass inserted in the piping system to make the contents visible to the operator. A manually operated cleaning device is provided for removal of material adhering to the inside of the glass. A cleaning solvent can be forced against the inside of the glass to facilitate removal of grease, oil, etc. Applicable to sludge lines, supernatant liquor and other applications where it is desired to easily observe the character of the material being handled. Installations reveal how suddenly the sludge from a sedimentation tank changes in density. Helpful to the plant operator in diminishing the amount of unnecessary liquid pumped to digesters.

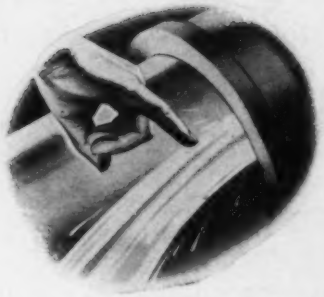
For complete information without obligation regarding any of the equipment described, communicate with any of the addresses listed below.

PROCESS ENGINEERS INCORPORATED

212 SUTTER STREET
SAN FRANCISCO 8, CALIF.

6381 HOLLYWOOD BLVD.
LOS ANGELES 28, CALIF.

EASTERN AND MIDDLE WESTERN REPRESENTATIVE:
PACIFIC FLUSH-TANK COMPANY • 4241 RAVENSWOOD AVE., CHICAGO 13, ILL.



A hole in a joint no larger than the end of your little finger will, under 65 psi pressure, discharge more than 80,000 gpd.

Fix it once...

Fix it for good

"Small" leaks cost you so much in gallonage . . . and repeated repairs cost you so much in dollars and cents . . . that the only practical repair is one that's *permanent.*

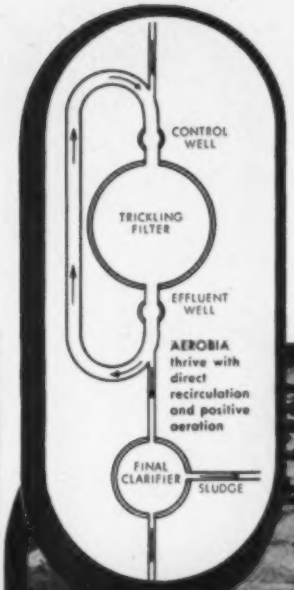
A permanent repair is certain every time when you put on a Dresser Bell-Joint Clamp. Clamping seals the joint with resilient rubber compound—provides a flexible repair to guard against future pipe movement, vibration and stresses which cause recalked joints to leak again and again.

It's standard practice to clamp all cast-iron bell and spigot joints near railroad tracks, on bridge lines, in unstable soil. Why not then make sure *every* repair lasts—why not "Fix it once—Fix it for good" the first time you uncover a leaking joint?

The Dresser Style 60 is adjustable to fit standard pipe, classes A thru E, and most off-size pipe. Sizes 3" to 60". Write today for descriptive literature and prices.

DRESSER
BELL-JOINT CLAMPS

Dresser Manufacturing Division, 59 Fisher Ave., Bradford, Pa. (One of the Dresser Industries). Warehouses: 1121 Rothwell St., Houston, Texas; 101 S. Bayshore Highway, South San Francisco, Calif.—Sales Offices: New York, Philadelphia, Chicago, Houston, South San Francisco. In Canada: 629 Adelaide St., W., Toronto.



how Worcester, Mass., modernized 1925 Sewage Plant with an

Accelo® Filter *system*

To give Worcester a modern 20,000,000 g.p.d. treatment plant, consulting engineers replaced 1925 equipment with the Infilco Accelo Filter system with *direct recirculation* and *positive aeration*. The system has 8 rotary distributors 176 ft. in diameter with aero-spray nozzles. Excellent distribution is obtained over filter surfaces with vigorous growth of bacterial gel. Three Infilco PD Clarifiers (foreground) provide effective final sludge removal.

Specify Infilco for:

- INCREASED FILTER EFFICIENCY
- NO INCREASE IN CLARIFIER SIZE
- INCREASED CAPACITY
- NO CLOGGING, SLOUGHING OR PONDING
- NO ODORS
- REDUCED PSYCHODA FLY NUISANCE

INFILCO

* BETTER WATER CONDITIONING AND WASTE TREATMENT SINCE 1914 *

INFILCO INCORPORATED | *Tucson, Arizona*

FIELD ENGINEERING OFFICES IN 26 PRINCIPAL CITIES

World's Leading Manufacturers of Water Conditioning and Waste-Treating Equipment

They've got Everything!

FLANGES
machined and drilled for perfect alignment with sleeves and crosses.
OVER-SIZE SEAT RINGS on gate valves permit use of full size cutters.
STRENGTH AND WEIGHT of long sleeves resist line pressure, caulking strains.
LARGE AREA
The flanges insure a water tight joint with the thick lead gasket running the full sleeve length.
SAVE caulking material. Centering ring provides caulking stop.

-for fast work and perfect results

STRONG

Rensselaer products are strong and heavy to stand all strains.

THRIFTY

The design of Rensselaer Tapping Sleeves saves caulking materials, time, labor, and results in a better job.

WATERTIGHT

You get a thick lead gasket the full length of every sleeve — solidly watertight forever.

MAKE THE JOB 100% RENSSELAER

For tapping or repair Rensselaer products meet all conditions and utilize all standard tapping machines. They make possible faster lower cost repairs on connections with lines under pressure — permanently leakproof finished jobs.

Experienced Water Works men depend on ALL products bearing the Rensselaer name. For good advice along these lines, just ask *your* Rensselaer representative.

LEADERSHIP FOR OVER 65 YEARS

RENSSELAER VALVE COMPANY

Hydrants • Gate Valves • Square Bottom Valves
Check Valves • Tapping Sleeves and Valves • Air Release Valves

TROY, NEW YORK

Division of Neptune Meter Company

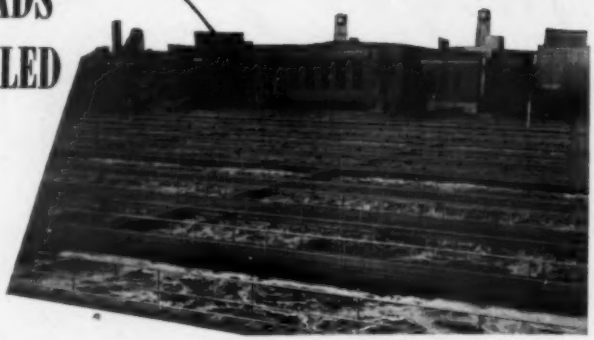
Atlanta, Bala-Cynwyd, Pa., Chicago, Dallas, Denver, Glendale, Calif., Haverhill, Mass., Kansas City, Mo., Memphis, New York City, Oklahoma City, Pittsburgh, San Carlos, Calif., Seattle, Wash.

SHOCK LOADS READILY HANDLED

WITH EXISTING EQUIPMENT

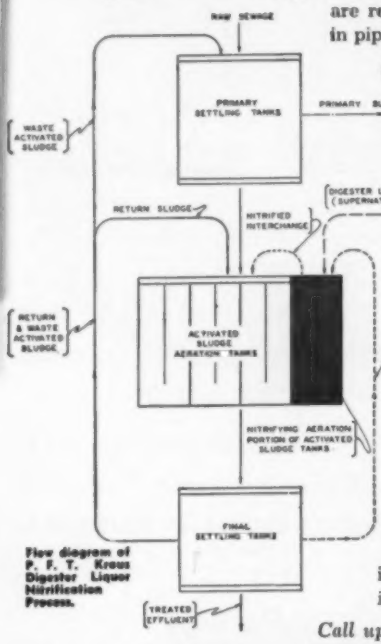
by the

P.F.T. KRAUS PROCESS



Activated sludge aeration tanks, Peoria, Ill. Three channels in foreground, out of a total of twelve aeration channels, are used for sludge nitrification.

The P.F.T. Kraus Process, also known as the "Digester Liquor Nitrification Process," can be readily applied to existing plants or incorporated in the design of new plants. No additional aeration basins or aeration facilities are required nor any greater amount of air. Only a slight revision in piping and return activated sludge pumping facilities are required.



Flow diagram of P. F. T. Kraus Digester Liquor Nitrification Process.

The P.F.T. Kraus Process provides these three plus values:

(1) Eliminates the need for expanding plant facilities by overcoming effect of greatly increased loads exceeding original plant capacity.

(2) Nullifies formerly disastrous effect of shock loads from industrial waste organic matter.

(3) Utilizes all digester liquor overflow to advantage in the main treatment process.

Using this system, sludge produced in the activated sludge process settles more readily to give better overall results in purification or allows reduction in capacity of secondary settling facilities. Another problem is effectively overcome by making use of digester liquor to advantage.

The highly nitrified sludge from the aeration tanks set aside for the nitrification process may be returned continuously to the normal activated sludge process or may be returned in amounts required to balance shock loads or organic matter introduced into the aeration tanks.

Call upon P.F.T. for details of how this process can help you.

P.F.T.

PACIFIC FLUSH TANK CO.

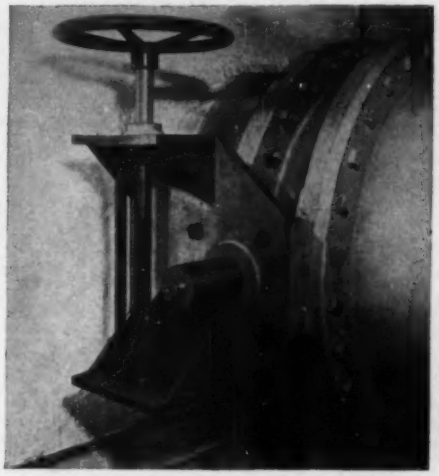
Waste Treatment Equipment Exclusively Since 1893

4241 RAVENSWOOD AVE. CHICAGO 13, ILLINOIS

NEW YORK • LOS ANGELES • SAN FRANCISCO • CHARLOTTE, N. C. • JACKSONVILLE • DENVER

R-S valvEvents

• EXCERPTS FROM THE R-S BOOK OF EXPERIENCE •



RUGGED Simplicity

Correctly engineered mechanically and metallurgically, all body assemblies of R-S Valves equal or exceed A. S. A. standards in every detail. These valves are designed and constructed for rugged service and provided with such safety factors that they will exceed service expectations as well as reduce pumping and blower costs.

Consider also the few working parts, greater control rangeability, the self-cleaning feature and the fact that R-S Valves are readily adapted to automatic operation. Know the rugged simplicity of R-S Valves, and get the most from your valve investment.

District offices are listed in telephone directories as, "R-S Products Corp'n Valves".

R-S PRODUCTS CORPORATION
4600 Germantown Avenue, Philadelphia 44, Pa.
An S. Morgan Smith Company Subsidiary

See the R-S Exhibit
at the
National Instrument Show
to be held in
Sam Houston Coliseum
Houston, Texas
September 10 to 14
inclusive
Booths 131, 135, 137 and 139

No. 739-740—Sixty-inch, 50-pound Heavy Duty Valve with gear reduction drive and handwheel for handling water at 40 psig. Vertical valve stem enclosed in steel pipe support. Thrust bearing absorbs vertical load.

No. 730—R-S Heavy Duty Floor Stand for rugged service in connection with any standard R-S handwheel operated valve.

No. 767—A 3-Way Valve (Two 24-inch 125-pound Cast Iron Valves bolted to 125-pound American Standard Tee). Electric motor operated by cross linkage. Automatic declutching handwheel for emergency operation.

***THE FIRST REAL PIPE THAT IS PLASTIC!**

CARLON . . . the outstanding pipe development of modern science . . . is tomorrow's pipe today. This new medium for fluid and gas transmission combines the inherent advantages of plastic with the desirable characteristics of metallic pipe to create unprecedented longevity, versatility and ease of installation.

Whether used for municipal water systems, sewage disposal, land drainage or other medium-pressure low temperature applications, CARLON has a trouble-free service life many times longer than ordinary pipe. It is guaranteed against rot, rust and electrolytic corrosion and will not accumulate scale or sediment. CARLON is inert to the chemical action of corrosive soils and waters.

CARLON plastic pipe is shipped in threaded and coupled random 21-foot sections. A complete line of CARLON plastic fittings incorporating standard I.P.T. is available to permit complete corrosionproof plastic installations as well as connection to fixtures and previously installed metallic lines.

At present, raw material shortages are limiting the production of certain types of CARLON pipe. Every effort is being made to overcome this problem and to meet the need for CARLON . . . the first real pipe that is plastic.

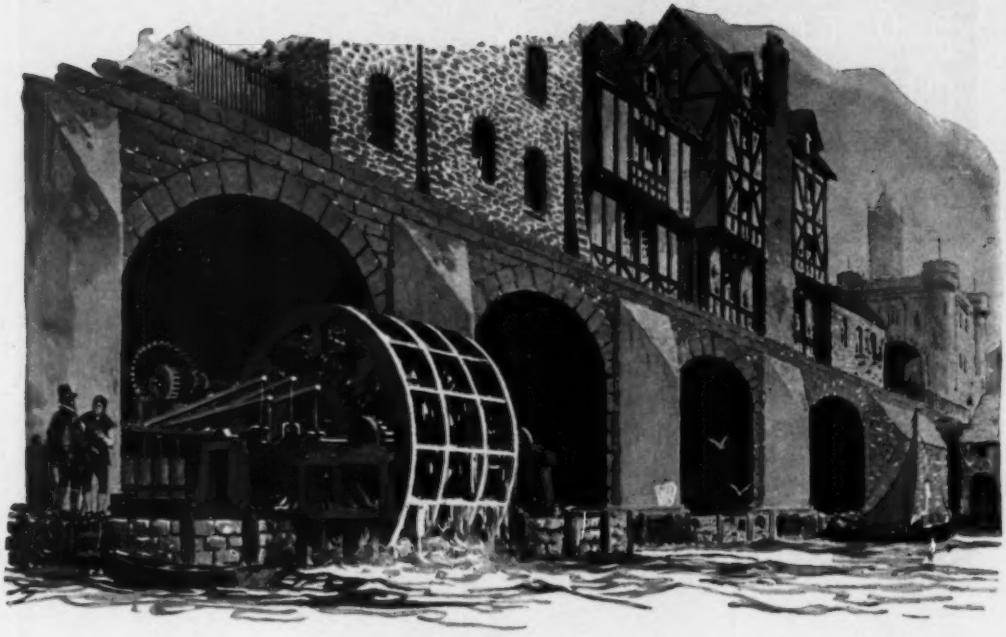
CARLON CP 218-CP

CARLON PRODUCTS CORPORATION

10132 Meech Avenue • Cleveland 5, Ohio

In Canada: Micro Plastics, Ltd., Acton, Ontario

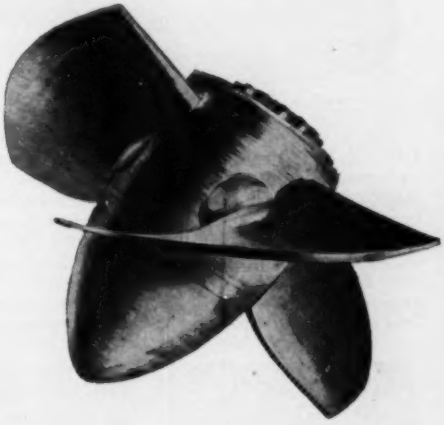
in 1582 when this machine pumped London's Water



SKIP the centuries!

In this country alone there are systems that would shame London's great contribution, even in our smallest towns.

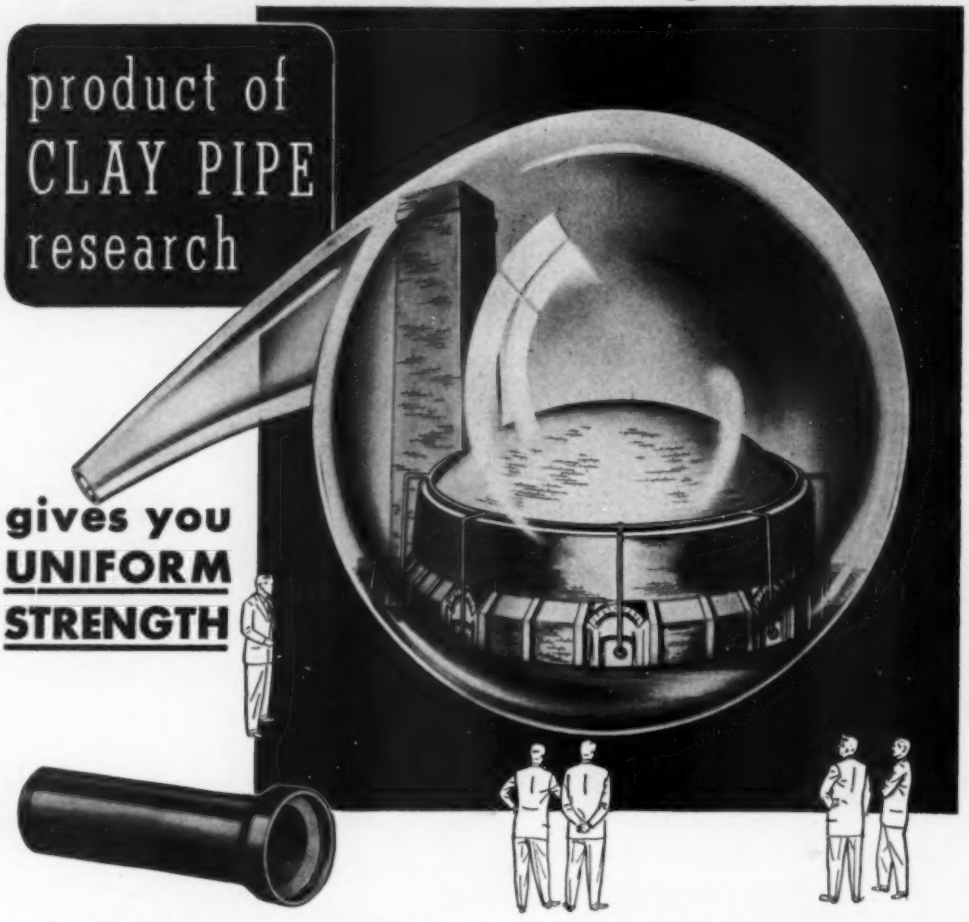
A Parade of Progress in which Smith Rotovalves and Axial Flow Pumps have marched in the very forefront! Good reason for putting your hydraulic problem in our hands, isn't it?



S. MORGAN SMITH Co.

YORK, PENNA. U.S.A.

controlled firing...



CONTROLLED FIRING . . . is a factor behind the *uniformity* of Vitrified Clay Pipe — whether it's one length, or a million. Electronic instruments correctly balance Clay Pipe firing time and temperature. This modern technology, harnessed to govern manufacturing processes, *improves* Clay Pipe's basic quality. Clay is chemically inert, completely unaffected by corrosion or the chemical wastes of modern industry. It's the *best* pipe for *your* sewerage or drainage projects.

NATIONAL CLAY PIPE MANUFACTURERS, INC.
100 N. LaSalle St., Rm. 2100, Chicago 2, Ill.
206 Connally Bldg., Atlanta 3, Ga.
703 Ninth & Hill Bldg., Los Angeles 15, Calif.
311 High Long Bldg., 5 E. Long St., Columbus 15, Ohio

WRITE FOR DETAILED INFORMATION

Additional information and data on Vitrified Clay Pipe, Wall Coping and Clay Flue Lining sent FREE on request. State your specific questions. Simply contact the regional office nearest you.

Vitrified
CLAY
CLAY PIPE NEVER WEARS OUT!
PIPE

C-151-11

HERESITE

REG. U. S. PAT. OFF.

Baking Type PHENOLIC COATINGS: Self-Curing Type

The above view shows a section of the clarifier room in a sewage disposal plant which has been coated with the **Heresite VR-500** series air drying coatings containing anti-fungus agents. After approximately 10 years of service the coating is still in good condition. The complete resistance of the VR-500 series coatings to moisture, mild acids and alkalis make them ideal for applications of this type.

The **HERESITE A-600** series coatings possess exceptional resistance to caustics and alkalis. Only evaporation of the solvent is required to produce a tough, insoluble, homogeneous film.

HERESITE & CHEMICAL COMPANY—Manitowoc, Wisconsin

to aid peak defense production

Collect and Sell your Iron and Steel Scrap

Mr. Q-Check says *dig* for scrap metal—*search* every nook and corner of your pipe yard—*scrape* the bottom of the barrel! For iron and steel scrap is critically needed to aid peak defense production in steel mills and iron foundries.

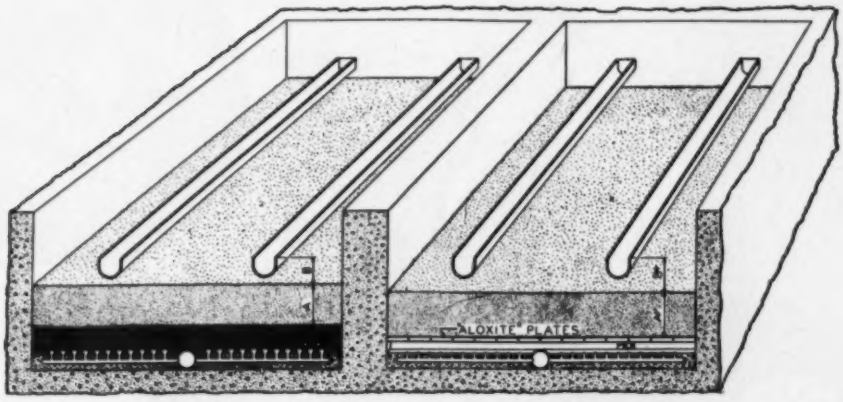
The average pipe yard has some or all of the following sources of scrap metal, according to whether pipe is used for water, gas, sewerage or industrial service:

Obsolete fittings; cut pipe (short pieces of distribution or service pipe); damaged hydrants, valve boxes, manhole covers, etc. It all adds up to a vital contribution to defense production.

Collect your scrap now. Phone your nearest scrap dealer. He wants what you have *but quick*, and pays good cash prices.

CAST IRON PIPE RESEARCH ASSOCIATION . . . CHICAGO

Planning to rebuild old shallow filters?



BEFORE **AFTER**

ALOXITE underdrains offer "extra dividend" features.

For operators of shallow filters, ALOXITE porous bottoms give all the basic benefits that follow elimination of graded gravel support. Moreover, they pay "extra dividends" by solving certain problems inherent in operating such units:

- When rebuilding old-style filters (see "Before") to get proper wash rates, these porous plates permit you to lower filter media. Back washing can then be stepped-up to use greater available distance (B+) to wash gutters. And with the "After" design you profit by a simultaneous increase in operating head for filtration. Where necessary, the filter media bed can be deepened (A+) as porous plate construction supplies a lot of added space.
- In designing new filters, topography may be such that available head is very limited and critical. Here the extra head provided by the construction of ALOXITE filter bottoms may solve the problem.

When seeking ways and means of improving your filters, don't overlook ALOXITE aluminum oxide porous plates. For shallow filters — or *any other type of filter* — underdrains of this type have proved to be distinctly superior.

EVIDENCE: There are nearly 300 installations of ALOXITE filter bottoms in operation today — *some of which are in their 15th year of service!*

REASONS: You'll find them in our new 56-page booklet "Porous Media for Filtration and Diffusion." It's a complete reference handbook — contains a wealth of useful charts, graphs, and photos. A copy is yours for the asking.

THE CARBORUNDUM COMPANY

Dept. M-81 Refractories Div. Perth Amboy, New Jersey

"Carborundum" and "Aloxite" are registered trademarks which indicate manufacture by The Carborundum

Why do it the hard way?

calgon® solves major water problems with Ease

CALGON PREVENTS the precipitation of calcium carbonate upon the addition of alkali or, following softening, prevents after-precipitation.

CALGON PREVENTS the scale formation that occurs upon heating waters high in bicarbonate hardness.

CALGON PREVENTS the precipitation of dissolved iron or manganese from well water even though the water is subsequently fully aerated, heated or chlorinated.

CALGON PREVENTS the ravages of corrosion by forming a protective film on metals at pH values of 5.0 and higher, thus reducing the attack of oxygen to such an extent that corrosion ceases to be a problem.

We will send you detailed information on any specific problem in which you are interested.

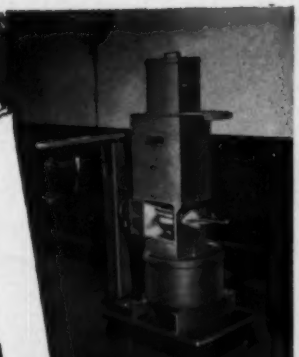
CALGON, INC.

HAGAN BUILDING • PITTSBURGH 30, PA.

Fluoridation News

1945 1951

IN TEXAS, TOO —



CITY OF MARSHALL

MARSHALL, TEXAS

January 24th, 1951

Wallace & Tiernan Co. Inc.
1112 National City Bldg.
Dallas 1, Texas

Gentlemen:

The City of Marshall, Texas began fluoridation of its municipal water supply in the Spring of 1946, under the jurisdiction of the Texas State Health Department. Marshall was the first city in the State of Texas to use fluoridation.

In February 1950, we changed our method of fluoridation by feeding sodium fluoride with a Wallace & Tiernan Type NA Dry Chemical Feeder.

We have found the Wallace & Tiernan Type NA Feeder to be simple in operation, easy to adjust and maintain, and extremely accurate for feeding sodium fluoride. We have been able to hold the fluoride content of our treated water very constant by using this feeder.

We would be glad to recommend this feeder to any town considering adding fluorides to the public water supply.

Very truly yours,

CITY OF MARSHALL

J.W. Schonhardt

J.W. SCHONHARDT
Water Superintendent

When *your* community is ready to look into fluoridation — and after you have consulted your State Department of Health — you'll find W&T Engineers ready and willing to help you.

WALLACE & TIERNAN
COMPANY, INC.
CHLORINE AND CHEMICAL CONTROL EQUIPMENT
NEWARK 1, NEW JERSEY • REPRESENTED IN PRINCIPAL CITIES

Another Important Instrumentation Development by Beckman . . .

* Greater Compactness
* Higher Accuracy
* Lower Sample Consumption
* Maximum Convenience

THE NEW BECKMAN
Flame Photometry Attachment

To meet the steadily growing interest in flame spectrophotometric methods, Beckman engineers have developed a new Flame Photometry Attachment that sets greatly advanced standards of compactness, convenience, accuracy and simplicity.

Used with the Beckman "DU" Spectrophotometer and standard oxy-hydrogen or oxy-acetylene equipment, it combines the unusually high accuracy and resolution of the well-known Beckman "DU" with the conveniences of flame spectrophotometric methods, providing an instrument capable of the quantitative determination of more than 40 elements, including heavy metals and rare earths, as well as the alkali metals.

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Illustration at right shows atomizer-burner actual size.

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- Sample concentration is unimportant (provided it is above the lower detectable limit) permitting maximum versatility and convenience in making analyses.
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- The atomizer-burner, sample-positioning device, focusing mirror and adjustments are all unitized into a compact, cast-metal housing. All necessary regulators and gauges (except standard regulators on fuel and oxygen tanks) are conveniently mounted on a separate control panel.

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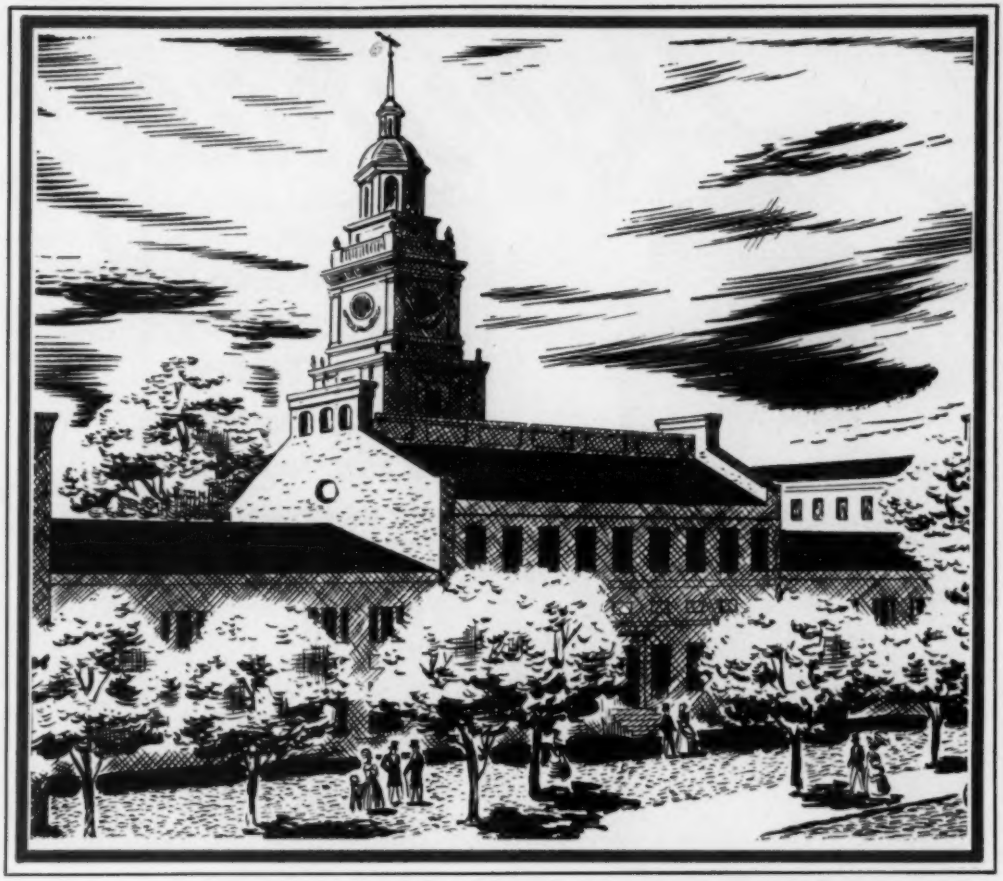

Philadelphia's Independence Hall, where the Liberty Bell is housed, as it looked 100 years ago

Philadelphia has cast iron water and gas mains in service that were laid well over a century ago. One of them is America's oldest cast iron water main, still functioning despite the radically changed conditions of street traffic and underground utility services in 100 years. The fact that cast iron pipe, laid generations ago, withstands the shock of heavy-duty traffic and the stresses caused by congested underground structures, amply demonstrates its shock-strength and beam-strength. Because of these strength factors and effective resistance to corrosion, cast iron water and gas mains, laid over 100 years ago, are still serving in the streets of more than 30 cities in the United States and Canada. **United States Pipe and Foundry Co., General Offices, Burlington, N. J. Plants and Sales Offices Throughout the U. S. A.**

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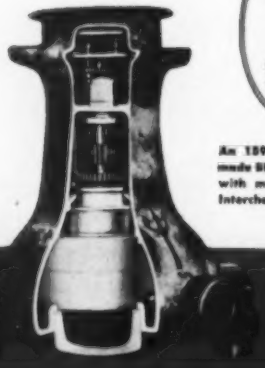

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WATER & SEWAGE WORKS

VOL. 98, NO. 8 • A GILLETTE PUBLICATION • AUGUST 1951

The Miami Convention of AWWA

Wind-up Installment of the Report Covering the 71st. Annual Meeting

EARLIER installments of this report covering the 71st Annual Convention of the Am. Water Works Assn. appeared in our June and July issues. Elsewhere in this same issue the sessions of the Water Purification Division are covered in a separate report, which with this installment winds up the report covering AWWA's largest convention of all time.

National Water Policy

Sam'l. B. Morris
Chief Engr. & Genl. Mgr.
Dept. Water & Power
Los Angeles, L. A.

Dr. Abel Wolman
Prof. Sanitary Eng.
Johns Hopkins Univ.
Baltimore, Md.

A National Water Policy

One entire general session was devoted to a discussion of a "National Water Policy" in which SAMUEL B. MORRIS, past-president of AWWA and member of the President's Water Resources Policy Commission, led off with a highlight review of the recently released report of this temporary commission appointed by President Truman to study the present water resources situation and recommend a pattern for adoption as a National Water Policy.

Mr. Morris said that the Commission's staff comprised 40 specialists and aids borrowed from federal and state agencies; that 10 major drainage basins had been studied and problems reviewed; that public hearings had been held in eight sections of the country; that wasteful competition had been found to exist between U.S. Army Engrs., the Bureau of Reclamation and other agencies handling water control and water use projects. In connection with irrigation, flood control and power development Mr. Morris reported methods of financing which results in the taxpayers at large paying for projects of regional or even local benefit, at little or no cost to those benefitted.

In highlighting the Commission's recommendations of interest to water and sewage authorities and local governments stated that:

(1) Water supply should remain in local agencies with Federal loans at low interest, but with complete repayment of such loans.

(2) Irrigation and flood control should both be paid for in goodly part by those benefiting from such Federal or State-Federal projects.

(3) Stream pollution abatement should continue under Public Law 845 at the State level with Federal assistance for at least the first 10 years, at the end of which some reconsideration might properly be given if progress has not been sufficient.

(4) A Board of Review should be appointed to study and evaluate every Federal project of any consequence as to soundness and economic feasability before proceeding beyond the planning stage.

(5) In general the River Drainage Basin is considered the proper working unit for water resources problems, including pollution control. The governing body would represent Federal, State and Local Governments. Financing would be participated in by all three, with local beneficiaries paying a fair proportion. Irrigation was singled out as being inequitably financed under present methods and proposed extension of such projects which could not be justified on any economic grounds and likewise creative of over production of agricultural produce.

Mr. Morris ended with the note that when all considerations are weighed there is no natural resource more deserving of Federal oversight and financing than this Nation's water resources.

Now, The Engineer's Viewpoint

Looking at a National Water Policy from the viewpoint of the engineer, ABEL WOLMAN, chairman of AWWA's Committee on Water Policy, and chairman of the Coordinating Committee of Engrs. Joint Council's Water Panel, proceeded to take apart the report of the President's Water Resources Policy Comm. Mr. Wolman said that there was much to criticize in the President's Commission Report which is at variance with sound engineering practice and that the E.J.C. Water Panel was in process of pointing out grounds for objections to the report of the President's Commission which was filled with inconsistencies throughout and many statements and reasoning were at variance with the recommendations.

National Water Policy

Fred Merryfield
Prof. San. Eng.
Oregon State Col.
Corvallis, Ore.

Malcolm Pirnie
Consulting Eng.
New York, N.Y.

In highlighting the report of the E.J.C. Panel and its 9 task groups, representing the thinking of 80 experts from the Nation at large, Dr. Wolman rounded out the opinions of these leading engineers to be—

(1) That water projects should be handled at the lowest government level practicable. And the same applied to pollution control.

(2) That every Federal or Federal-State project should be appraised by an independent board before proceed-

ing beyond the survey and proposal stage.

(3) That there is a limit to sources of funds from the tax paying public.

Chief among the criticisms of the E.J.C. Panel are the following:

(1) Inconsistency throughout the report and recommendations not supported by the text.

(2) In too many instances the "Social Good" is taken as ample reason for expenditures of Federal funds for regional benefits—many being hypothetical.

Resources Div. Officers

Geo. E. Fergusson
Water Resources Div.
U. S. Geol. Survey
Washington, D.C.
(Chairman)

Dale L. Maffitt
Gen'l. Manager
Water Dep't.
Des Moines, Ia.
(Vice-Ch'mn.)

(3) Irrigation project financing is nothing more than paying subsidies to farmers in one section by taking money out of the pockets of farmers in another section of the country. Something needs be done about the Irrigation and Flood Control "pork barrel."

(4) The report is inconsistent in recommending local responsibility for water supply projects, while in the same volume advocating financing on a River Basin level.

These are just some of the counts which are to be filed by the Engrs. Joint Council against a document which appears to have been drawn to mean "everything to everybody" depending upon what page one is reading.

Objectives of a National Water Policy

MALCOLM PIRNIE, Consulting Engr. of New York City, discussed what the objectives of any National Water Policy should be. He pointed out that water is the one natural resource which can not be preserved by reduced use. Also, that Stream Basin Compacts should be the highest level for determination of need for water projects and economic considerations, allocation of costs, etc. Such compacts as those of the Ohio River Valley and the Delaware River Basin were making history in this direction. The latter is based on the ruling of the U.S. Supreme Court in allocating the waters of the Delaware River to the various States and municipalities.

Local and Regional Water Supply Management

"Water Supply Management" was discussed by DALE MAFFITT, Manager of the Des Moines Water Works, and FRED MERRYFIELD, Cons. Engr., Corvallis, Oregon.

Mr. Maffitt discussed the Missouri River Basin plan including 105 dams in which it is proposed that participation be by States. The question is—"Who will operate the facilities once they are built?" Mr. Maffitt said that every water works man should let his Congressmen know their interest and warn of the care to be exercised in reaching decisions on water resources projects.

Mr. Merryfield, basing his comments on experience in the Columbia River Basin, warned that Federal engineers are in many instances competing with consulting engineers. Horse-back decisions are made with too meager data. Cases were cited.

A. G. MATTHEWS, Chief Engr. State Water Survey, Tallahassee, Fla., also called attention to inconsistencies and oddities in the President's Commission report which came to light on repeated reading. Having had experience on Federal irrigation projects, Mr. Matthews was rather pointed in his comments on the financial unsoundness of such projects.

Rubber Pipe Joint Rings

"Pipe Jointing Rings of Rubber and Synthetic Rubber" were discussed by W. L. WHITE, Director of Research, The Manhattan Rubber Div. of Raybestos-Manhattan Inc., Passaic, N.J.

Mr. White traced the history of natural rubber pipe jointing rings since 1870 when first used in Elizabeth, N.J., and still alive and in service. Now, since 1945, synthetic rubber has been employed and experience and drastic tests have proved the G.R.S. cold process synthetic superior in many respects including "flow."

In reply to questions Mr. White saw no real need for the lead tipped gaskets except for improving electrical conductance in the joints. The synthetic gaskets could be held for years in storage in a cool dark place without deterioration.

Applications of the Heat Pump

The Heat Pump and what "makes it tick" was discussed by N. C. EBAUGH, Cons. Engr. of Gainesville, Fla., in an interesting explanation showing the possibility of heating residences in winter from heat units extracted from well water and thereby increasing water sales in winter, while increasing water sales in summer for the reverse operation—air cooling. Sorry we can not spare the space here to go deeper into this interesting possibility of employing water for both heat extraction (space heating) and also heat absorption (space cooling).

Resources Div. Officers

F. W. Kittrell
Stream San. Chief
T.V.A.
Knoxville, Tenn.
(Secretary)

L. E. Goit
Ch. Aqueduct Engr.
Dept. Water & Power
Los Angeles, Calif.
(Director)

Analysis of Pipe Networks Electrically

Prof. MALCOLM S. MCILROY, Electrical Engr., Cornell Univ., presented case histories in which he had applied his electrical conductivity method of analyzing pipe networks, and for which development he received The Goodell Prize for his paper describing the method. Possibly the most spectacular value of the method was demonstrated in connection with the cooling water system at an oil refinery. Two other simpler cases were also reported. Instead of replacing pipe lines in the refinery the solution, after 13 trials, proved to be a booster pumping station at the proper location fixed by the electrical analysis.

Research on Sulphur Jointing Compounds

R. B. SEYMOUR, Technical Director, Atlas Mineral Products Co., Mertztown, Pa., in an illustrated talk presented a progress report covering 2 years of investigation into the deterioration of pipe jointing compounds of the silica-sulpher type widely used in jointing water pipes.

We regret that we can not relate here all of the details of developing test equipment for studying strains within pipe joints in cooperation with Lehigh Univ., and the many other details of the studies. The studies are being continued but to date the results reveal the bad effects of soluble salts

in the compound which leach out and accelerate disintegration. Also the presence of soluble salts created corrosion which attacked imbedded steel nails and caused splitting of test specimens of joint compound. For the present Mr. Seymour felt that the work had barely been started in the new laboratories and test area. So far the only conclusions which could be considered final are:

(1) Do not use sulfur joint compound if the soil or other conditions

Programmers

Paul Schweitzer
President
Layne-Atlantic Co.
Norfolk, Va.

Wm. A. Glass
Director
Dept. Water & Sewg.
Miami, Fla.

will attack cast-iron pipe—for instance at pH of 4 or under.

(2) Do not use sulfur joint compound in highly alkaline soils of high sulphate and pH value.

(3) Rather confounding, experience records in the field had not yielded any definite conclusions as to the real cause of joint failures reported.

Unfortunately the hour was so late that there was no opportunity to ask Mr. Seymour questions after his report.

Water Resources Division*

Safe Yield

"Safe Yield of Ground Water Sources" was introduced briefly by Malcolm Pirnie, Cons. Engr., New York City and several phases of the subject were then discussed by other speakers. Mr. Pirnie stated that we have heard a great deal about the safe yield of water supplies but up until the present time little attention has been given the matter. We are now experiencing trouble and it is necessary that we make more accurate appraisals of the safe yield of our ground water resources.

During the past twenty-five years much data has been obtained on Florida's ground water supplies, for instance, but it chiefly reveals that something has to be done to insure adequate supplies in the future. The first salting of ground water supplies in Miami was not noted until 1939. This resulted in a study of this problem in recent years. Rainfall and other factors contribute to the safe yield of any ground water supply.

Geology

"Geologic and Hydrologic Factors" of the safe yield of ground water sources, was the title of a paper by V. T. Stringfield, Geologist, USGS, Washington, D.C. H. H. Cooper, Dist. Engr., USGS, Tallahassee, Fla., who presented Mr. Stringfield's paper, pointed out that the safe yield of a formation is the amount of water that can be withdrawn year after year. The basic concepts in determining the perennial yield are: 1—The maximum drawdown that can be tolerated; 2—The number and distribution of the supply wells; 3—The character of the formation, and 4—The character of the recharge area. If the demand for water in Florida continues to increase, the perennial yield of the aquifer will be reached. Some areas have already reached that state. The consequences of exceeding the safe yield of a formation is using water in storage and an ultimate depletion of the supply and also salt water encroachment. To predict the perennial yield of an aqufer is a complex problem but Mr. Cooper predicted further advancements in the field of ground water hydrology in the years ahead which will enable more accurate appraisals in the future.

Miami's Problem

"Miami's Water Supply Problem," by G. G. Parker, Sr. Geologist, USGS, Washington, D.C.

The investigation of Miami's water problem was one of the first major ground water studies initiated in southeastern United States. It was started in 1939 and is still in progress. More than 200 test wells were drilled at the start of the investigation for the purpose of determining the coefficient of transmissibility and storage needed in determining the safe yield. The geologic formations underlining Miami are the most permeable that the U.S. Geological Survey has ever investigated. It is not uncommon for a 6-inch well to yield 1000 gallons per minute with practically no drawdown. Wells will average about 90 feet deep. Miami's problem is principally one of salt water intrusion.

A drought occurred in 1944 and 1945, resulting in an accumulated deficiency of rainfall of 58 inches. This caused a drop in the water table and salt water moved in at a rate of 235 feet per year. Another reason for the intrusion of salt water is that the canals drain the fresh water from the surrounding formations and allow salt water to move inland. Legislation was required to permit the construction of control dams in the canals and since this has been done, the advancement of the salt water face has been checked in most places.

Programmers

Jas. C. Harding
Commissioner
County Public Wks.
White Plains, N.Y.

Herb. E. Hudson
Chief, Eng. Div.
State Water Survey
Urbana, Ill.

Well Construction

"Construction and Operation of Wells" was ably discussed by Paul Schweitzer, Pres., Layne Atlantic Co., Norfolk, Va.

Digging of wells is not a modern inovation according to Mr. Schweitzer. Ancient wells of China were dug by hand, some being as much as 2000 feet deep, generations being required to complete them. Some of these ancient wells are still in existence today. Equipment and technics now employed in well drilling have been greatly improved in recent years but modern well construction is of little value if water is not available.

A recent and unique development in water well construction for increasing the yield of standard tubular drilled wells in the *Ferdina* area was described by the speaker. The wells penetrated a cavernous formation and it was felt that the yield could be substantially increased if additional openings could be made into these solution channels. A whipstoch was inserted in the well and additional holes were drilled below the casing at an angle from the vertical. These wells were drilled by the rotary method and are called offset wells. Two and three offset wells were drilled in each well. By this process the net daily combined yield of the old wells was increased 70% without lowering the former pumping level.

Following the presentation of the above papers they were formally dis-

*Reported by Chas. H. Bechert, Director, Div. Water Resources, Ind. Dept. of Conservation, Indianapolis.

cussed by W. A. GLASS, Director, Miami Dept. of Water and Sewers, and R. M. LEGETTE, Cons. Cod. Wat. Geol., New York City. Summarizing, Mr. Glass stated that several problems had to be considered in regard to Miami's water supply. Some of these are the maintenance of a sufficient head between the fresh water supplies and the ocean, constructing new wells a safe distance from existing tidal canals and also new ones, placing proper controls in canals, and properly spacing new wells to prevent excessive cones of depression. He further emphasized the fact that if Miami continues to grow, all future ground water developments will have to be based on sound principles.

Max Leggette suggested that instead of calling the safe yield of a formation by that name that it be called dependable yield. He pointed out that there are many areas where the annual recharge of ground water is very meager but there may be large quantities of water in storage. Does this mean that we should leave this water that is in storage alone or should we use it as other minerals? One underground reservoir so described could provide safe pumping for 200 years. More thinking should be given to what can be done to increase recharge of ground water formations artificially.

Sealing Abandoned Wells

"RECOMMENDED PRACTICE FOR SEALING ABANDONED WELLS"—A Committee Report by James C. Harding, Comm. Pub. Works, Westchester Co., White Plains, N.Y.

This subject was assigned to his committee in June, 1950, and the principle activity of the committee during the past year was devoted to developing specifications for well seals. The paper presented by O. J. Muegge at the Philadelphia Convention was used largely as a basis for the committee's work. The first draft of the report is now available and the committee would like suggestions for any changes. The specifications will not cover every case but should be interpreted by a competent engineer where any question arises. The committee is recommending that its specifications be added as an appendix to the Standard Well Specifications.

Mortality

"MORTALITY OF WATER WELLS," was the title of an important talk given by Herbert Hudson, Ch. Engr., Ill. State Water Survey Div., Urbana, Ill.

The talk was illustrated with slides which were based on data from 2600 wells in Illinois. Mortality figures were given on many types of wells, including dug, porous concrete, perforated concrete, unscreened and screened wells and the gravel pack type, all of which were equipped with a variety of pumps. The period of observation on gravel packed wells was not sufficiently long to reveal much information. The life of wells is dependent on several factors, such as the formation in which it is finished, the rate of pumping, change in water demands and improvements in pumping equipment. The average life of many wells is about 50 years.

Presiders

John L. Hawkins
Sup't. of Water
Greenville, S.C.

Richard Hazen
Consulting Engr.
New York, N.Y.

Present to discuss Mr. Hudson's subject were Messrs. H. E. Lauman, Pres., C. W. Lauman Co., New York City and W. A. McEllhiney, Pres., A. J. Miller Art. Well Co., Brookfield, Ill. Mr. Lauman said that in Long Island most wells are abandoned for one of several reasons, generally, due to changing conditions, drop in water levels, change in type or method of pumping and incrustation of well screens. Mr. McEllhiney was of the opinion that many wells were retired prematurely, they only needed attention to keep them off the retired list. He reasoned that wells are retired too often because of a lack of over-all planning, because of an unrealistic approach to the maintenance problem and because it is frequently the political expedient thing to do. His final statement—"Old wells will never die but are misused and abused."

Business Session

A short business session of the Division of Water Resources was held during the afternoon session at which time the following officers were elected:

Chairman — George Ferguson, Wash., D.C.

Vice-Chmn.—Dale L. Maffitt, Des Moines, Iowa.

Sec.-Treas.—F. W. Kittrell, Knoxville, Tenn.

Director—Fred Merryfield, Corvallis, Wash.

Director—Lawrence E. Goit, Los Angeles, Calif.

Mr. Ferguson reported that the Water Resources Division Board of Direction was recommending that Committee E-3 whose assignment was "Watershed Management" be terminated and that two task forces be established; one to study Watershed Protection and Erosion Control and the other Watershed Management. Another recommendation was to establish other task forces for specific projects when needed and abandon these groups when their work was completed in lieu of setting up permanent committees. Some suggested projects for future consideration and study included: 1. Weather Control. 2. Production of Usable Water from Salt Water. 3. Artificial Recharge.

Some suggested topics for the 1952 meeting were: 1. Watershed Control. 2. Water Use. 3. Weather Control. 4. Multipurpose Developments for Public Water Supplies.

Latin American Water Supply

"WATER SUPPLY DEVELOPMENT IN LATIN AMERICA" was the title of a general session in which representatives of Chile, Cuba, Mexico, Puerto Rico, and Venezuela presented papers. A wealth of useful information relating to the plans and progress of each country was presented. Many of the problems involved are quite special, and cannot be solved on the basis of North American experience.

DR. A. P. BLACK, Past President of the AWWA presented a summary discussion of the subject and introduced the speakers. Water supply developments were then described in papers prepared by the following:

Chile: Ruperto Casanueva, Pan American Sanitary Bureau, Washington, D.C.

Cuba: Manuel J. Puente, Consulting Engr., Havana, Cuba.

Mexico: Miguel A. Mantilla, Director Gen. de Estudios y Proyectos, Secretaria de Recursos Hidraulicos, Mexico, D. F., Mexico, and Humberto A. Aluarez, and Armando Gutierrez, Engrs. de Recursos Hidraulicos.

Puerto Rico: Sergio Cuevas, Exec. Director, Puerto Rico Aqueduct and Sewer Authority, San Juan, P.R.

Venezuela: Jose R. Hurtado, Director, Water Lab., Instituto Nacional de Obras Sanitarias Caracas, Venezuela.

Basic Factors In Centrifugal Pump Application*

Part 4—Rating Curves and Charts; Model Pumps; Specific Speed

by ROY CARTER *and* I. J. KARASSIK, *Application Engineers, Worthington Pump and Machinery Corp., Harrison, N. J.*

A RATING curve for a centrifugal pump of specific design shows in a condensed form, the possible range of applications of that pump, either for a range in speed or for a range in impeller diameter. Some small centrifugal pumps for belt drive are manufactured in lots for stock sale, and the most efficient operating speed for each installation is obtained by selecting a proper pulley ratio to give the head and capacity condition desired. A curve showing the head, capacity, and B.H.P. for such a pump at a number of speeds, could be utilized for determining the speed necessary and the power involved. These rating curves are now rarely used. Instead, a table such as is partially shown in Fig. 20 is generally more convenient and permits showing a number of pump sizes on the same sheet.

A few lines of pumps, notably small motor driven stock units, are made with several different impeller diameters, of the same or different patterns, which load up various sizes of motors. A rating curve for this type is shown in Fig. 21. With such a line of pumps, a pump with a 25 HP motor and an impeller which would approximate the results shown on curve (2) would be furnished if the desired head condition fell anywhere within the zone between the H-Q curves (2) and (3) in Fig. 21. Thus, for some customer's requirements, such as 250 GPM 200 feet total head, the pump supplied would produce more capacity or head than required. When installed, this unit would either give excess capacity or excess pressure, depending upon the system, unless wasteful throttling were employed to increase the frictional head artificially.

For pumps which are built-to- order with an impeller pattern and diameter individually selected for the prevalent service condition, a curve showing, for a given speed, the range in conditions that can be met by a given impeller design or by several impeller designs, is used. These are generally complicated in appearance because the efficiency that can be obtained varies with the diameter of the impeller. This variation in efficiency is covered either by iso-efficiency curves, as shown in Fig. 23, or by figures on the curves of similar points ($Q/Q_1 = H/H_1$ relation) or lines approximating that relation as shown in Fig. 22. For their proper use, rating curves must also show the limits of suction lift at sea level (Fig. 23) or the required minimum net positive suction head (NPSH) shown in Fig. 22. (Ed. Note—NPSH has been defined and illustrated in Part 2 of this series

* The fourth of a series of articles on the understanding of and the selection and application of centrifugal pumps. Earlier installments are to be found in the January, February and May 1951 issues of this magazine.

GPM		TOTAL HEAD IN FEET														
		20	25	30	35	40	45	50	55	60	70	80	90	100	110	120	130
200	Size-Type	2-CF-1	2-CF-1	2-CF-1	2-CF-1	2-CF-1	2-CF-1	2-CF-1	2-CF-1	2-CF-1	2-CF-1	2-CF-1	2-CF-1	2-CF-1			
	HP	1.6	2.0	2.4	2.8	3.25	3.75	4.2	4.65	5.05	6.1	6.85	7.9	9.0			
	RPM	1010	1090	1170	1240	1310	1380	1440	1500	1550	1660	1750	1845	1930			
	Size-Type		3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1
	HP		2.25	2.6	3.0	3.3	3.6	4.1	4.6	5.0	6.2	7.3	8.3	9.4	10.5	11.9	13.1
	RPM		830	890	945	1000	1048	1095	1140	1185	1275	1355	1430	1500	1568	1635	1700
225	Size-Type	2-CF-1	2-CF-1	2-CF-1	2-CF-1	2-CF-1	2-CF-1	2-CF-1	2-CF-1	2-CF-1	2-CF-1	2-CF-1	2-CF-1	2-CF-1			
	HP	1.9	2.3	2.7	3.2	3.65	4.15	4.7	5.1	5.55	6.5	7.6	8.6	9.7			
	RPM	1055	1130	1205	1280	1345	1410	1470	1530	1585	1685	1785	1875	1960			
	Size-Type		3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1
	HP		2.6	2.9	3.3	3.6	4.0	4.6	5.0	5.5	6.6	7.8	8.9	9.8	11.1	12.5	13.8
	RPM		850	907	962	1015	1065	1113	1155	1205	1290	1370	1445	1510	1580	1647	1710
250	Size-Type	2-CF-1	2-CF-1	2-CF-1	2-CF-1	2-CF-1	2-CF-1	2-CF-1	2-CF-1	2-CF-1	2-CF-1	2-CF-1	2-CF-1	2-CF-1			
	HP	2.2	2.6	3.1	3.6	4.1	4.6	5.1	5.6	6.2	7.1	8.2	9.2	10.5			
	RPM	1095	1170	1245	1315	1385	1450	1510	1565	1620	1720	1815	1900	1990			
	Size-Type		3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1
	HP		2.9	3.2	3.6	4.0	4.4	4.9	5.5	5.9	7.2	8.3	9.5	10.4	11.7	13.2	14.6
	RPM		870	927	980	1035	1085	1130	1175	1220	1305	1385	1460	1525	1593	1660	1720
300	Size-Type	2-CF-1	2-CF-1	2-CF-1	2-CF-1	2-CF-1	2-CF-1	2-CF-1	2-CF-1	2-CF-1	2-CF-1	2-CF-1	2-CF-1				
	HP	3.0	3.5	4.05	4.55	5.1	5.65	6.25	6.75	7.3	8.5	9.65	10.9				
	RPM	1190	1265	1335	1400	1465	1530	1590	1645	1700	1800	1885	1970				
	Size-Type		3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1
	HP		3.5	3.8	4.3	4.8	5.3	5.8	6.5	7.0	8.2	9.6	10.8	12.2	13.1	14.9	16.4
	RPM		920	972	1025	1075	1125	1173	1220	1260	1340	1420	1490	1555	1620	1690	1750
350	Size-Type		3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1	
	HP		4.1	4.6	5.1	5.5	6.3	6.8	7.6	8.2	9.4	10.8	12.2	13.5	15.0	16.5	
	RPM		970	1025	1075	1120	1175	1220	1265	1305	1380	1455	1525	1595	1660	1720	
	Size-Type			4-CF-1	4-CF-1	4-CF-1	4-CF-1	4-CF-1	4-CF-1	4-CF-1	4-CF-1	4-CF-1	4-CF-1	4-CF-1	4-CF-1	4-CF-1	4-CF-1
	HP			4.2	4.8	5.6	6.2	7.0	7.7	8.4	10.3	11.8	13.6	15.3	17.6	20.1	21.8
	RPM			905	965	1020	1070	1125	1170	1215	1305	1387	1467	1537	1610	1677	1745
400	Size-Type		3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1	3-CF-1		
	HP		4.9	5.4	6.0	6.5	7.2	8.0	8.6	9.4	10.7	12.4	13.9	15.2	16.9		
	RPM		1025	1080	1130	1170	1225	1270	1310	1350	1425	1500	1567	1635	1700		
	Size-Type			4-CF-1	4-CF-1	4-CF-1	4-CF-1	4-CF-1	4-CF-1	4-CF-1	4-CF-1	4-CF-1	4-CF-1	4-CF-1	4-CF-1	4-CF-1	
	HP			4.8	5.6	6.2	6.8	7.5	8.3	9.1	11.0	12.6	14.6	16.5	18.6	20.9	
	RPM			930	990	1040	1090	1140	1185	1230	1320	1400	1480	1550	1620	1690	

Fig. 20—Portion of Modern Pump-Rating Chart.
These charts have largely supplanted the old pump-rating curves.

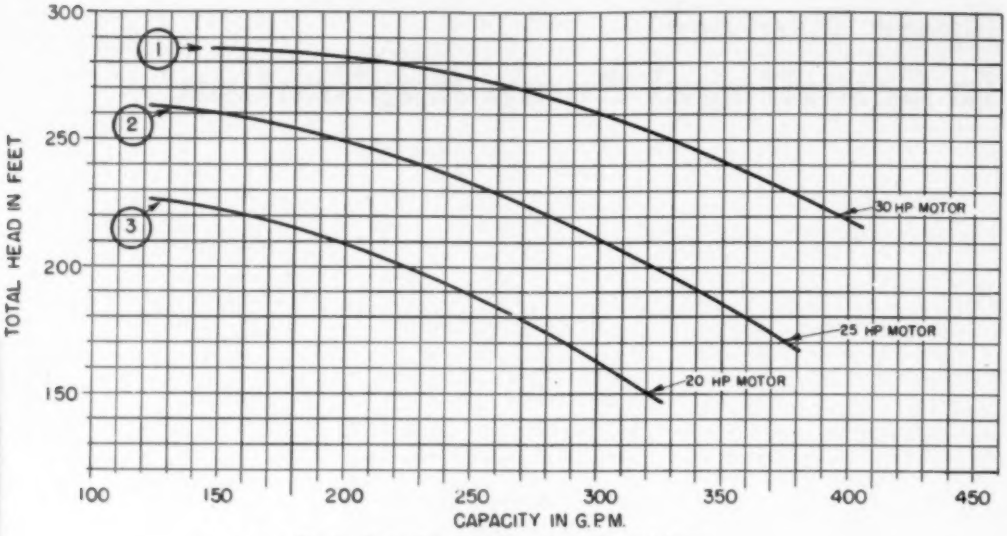


Fig. 21—Rating Curve of 2½ in. Motor Mounted Pump.
This pump equipped with impeller that load up size of motor used.

which appeared in the Feby. 1951 issue.)

Naturally, with such charts one is required for each motor speed for which the particular pump may be advantageously offered. For unusual conditions of driver speeds not covered by a curve, the use of standard relations for speed changes permit determining what the pump will do.

It should be noted that the required NPSH vs capacity relation for a given impeller design, at a given speed, varies with the diameter to which the impeller is machined. With low specific speed types, the variation over the usable range of impeller diameter is small and a single curve as on Fig. 22 can be used to apply to all diameters even though it is slightly conservative for the maximum impeller diameters. When the required NPSH vs capacity for an impeller design varies considerably over the range of useful application of impeller cutdowns this single curve to show required NPSH is not practical and the required NPSH can best be shown by diagonal lines like the suction lift limit lines on Fig. 23, but labeled with NPSH values or with both suction lift and required NPSH values.

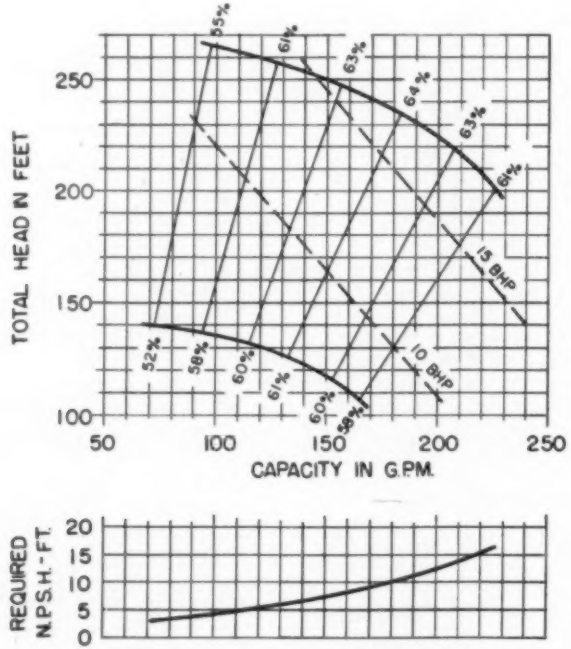


Fig. 22—Rating Curve of 2 in. Discharge 3500 R.P.M. Pump.

Suction Lift Limitations

If the suction lift limitation (at sea level and with 62°F water) for any head-capacity point of a pump is known, it is a simple matter to determine the required NPSH at that point as the NPSH is the atmospheric pressure minus vapor pressure minus suction lift. As the atmospheric pressure at sea level is 14.7 psia or 33.9 feet of 62°F water and the vapor pressure of 62°F water is 0.26 psia or 0.6 feet of 62°F water, standard atmospheric pressure minus the vapor pressure is 33.3 feet of water. Thus 33.3 feet minus the indicated suction lift limit gives the required NPSH. Similarly 33.3 feet minus the required NPSH gives permissible suction lift at sea level with 62°F water.

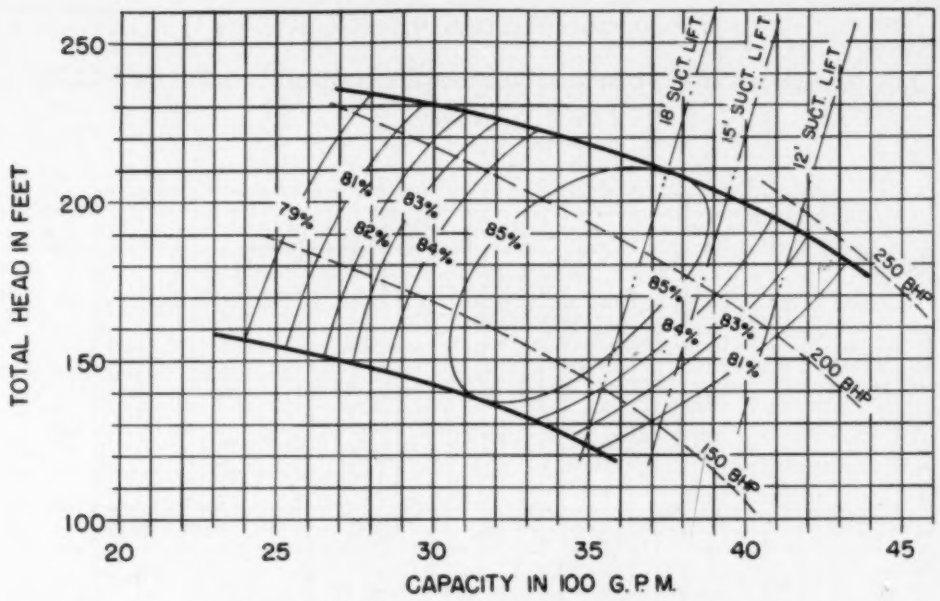


Fig. 23—Rating Curve of 10 in. Double Suction Single Stage Pump.
Reveals wide range that can be covered by an impeller of single design when machining it to proper diameter for service at hand.

Design Constants and Formula

The design of centrifugal pumps is not an exact science. This is because of the many inter-related factors whose combined effect cannot be accurately foreseen and thus must be determined experimentally. The development of centrifugal pumps has been largely a result of the accumulation of data on the performance of specific designs in service and of experimental designs. Also, the result of research and experiences in other hydraulic fields, and the application of this information in the development of new designs. In analyzing data, centrifugal pump designers use various constants, formulas and relations. Only two of these are of any real interest to users of centrifugal pumps—namely, Model Pump Relations and (2) Specific Speed.

Before discussing these, it should be pointed out that pumps are analyzed and compared basically at their so-called design conditions, that is under the head and capacity condition, at rated speed, at which maximum efficiency is obtained. Thus, for the pump whose characteristics is shown in Fig. 24, the design conditions would be 1480 GPM 136 feet total head at 1760 RPM.

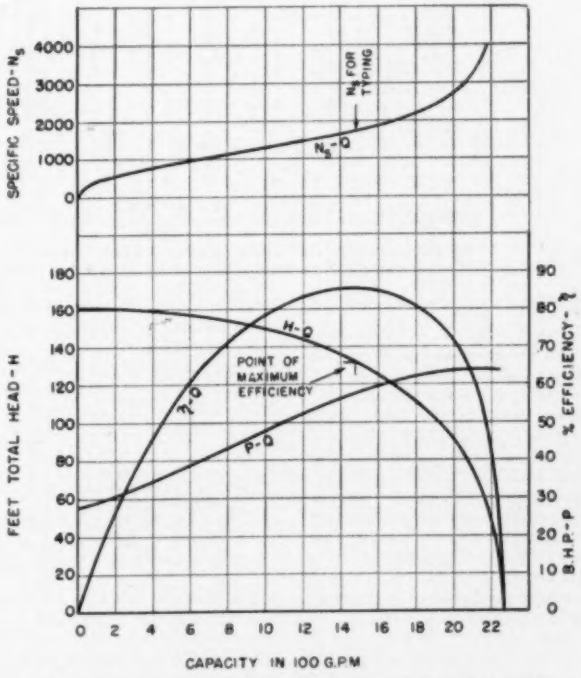


Fig. 24—Typical Pump Characteristics Graph with Auxiliary Specific Speed Curve Above.
This one for a 6 in. double-suction single-stage pump to operate at constant speed of 1760 RPM—see text.

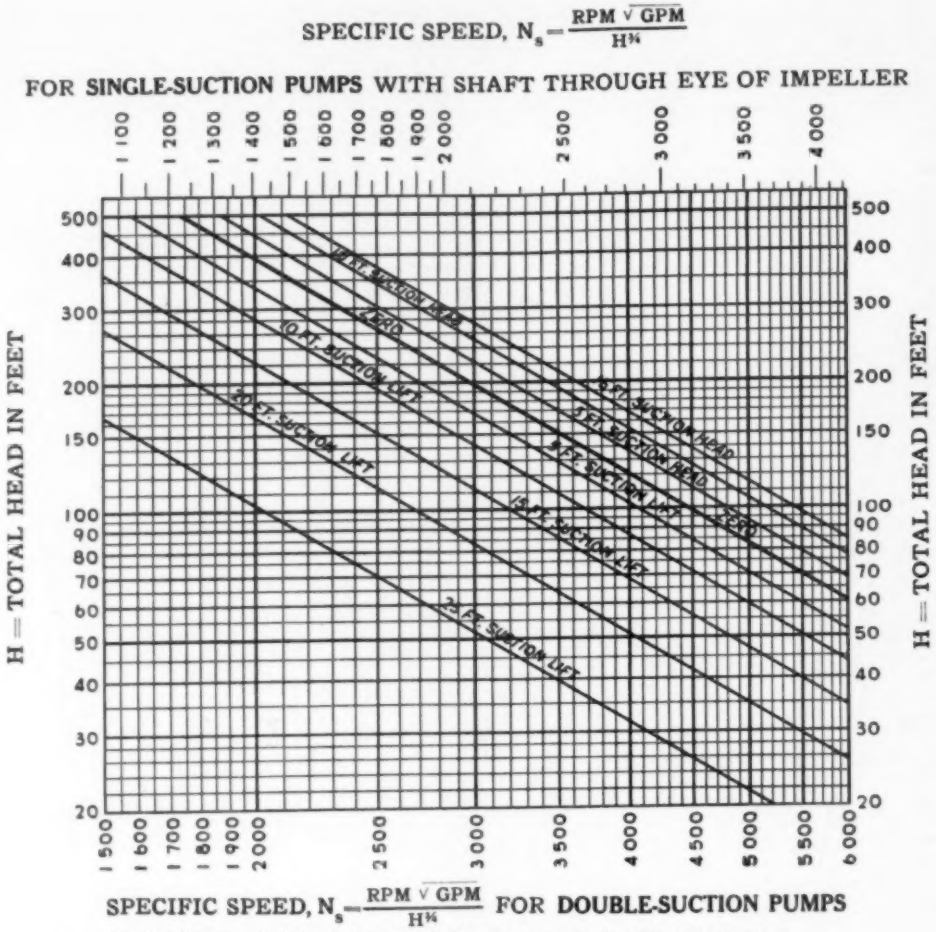

SPECIFIC SPEED, $N_s = \frac{RPM \sqrt{GPM}}{H^{3/4}}$
FOR SINGLE-SUCTION PUMPS WITH SHAFT THROUGH EYE OF IMPELLER
H = TOTAL HEAD IN FEET
15 FT. SUCTION HEAD
ZERO
0 FT. SUCTION LIFT
5 FT. SUCTION HEAD
5 FT. SUCTION LIFT
10 FT. SUCTION LIFT
15 FT. SUCTION LIFT
20 FT. SUCTION LIFT
SPECIFIC SPEED, $N_s = \frac{RPM \sqrt{GPM}}{H^{3/4}}$ FOR DOUBLE-SUCTION PUMPS

Fig. 25—Commonly Used Specific Speed Limit Chart. Developed by the Hydraulic Institute.*
(Application of this important chart for single stage pumps of true centrifugal type described in text.)

Model Pumps

A Model Pump is a pump which on a smaller scale has the design features of a full size unit. To become a strict model, all linear dimensions of the model must be in the same proportion as the corresponding dimensions of the full size pump. The theoretical relationship of the performance of a model pump can be easily visualized by considering two pumps identically proportioned with one having twice the linear dimensions of the other.

The impeller of the smaller pump will be half the diameter of the larger and will therefore have to run at twice the rotative speed of the larger for the same peripheral velocity and thus for equal design head. Also the areas thru the water ways of the smaller pump will be one half squared (i.e. ¼) the areas of the larger pump. Thus at equal velocities, the capacity of the smaller pump will be ¼ that of the larger pump. It therefore is apparent that for the same design head the inter-relationship of exactly similer pumps would theoretically be—

$$f = \frac{L_a}{L_b} = \frac{n_b}{n_a} = \sqrt{\frac{Q_a}{Q_b}}$$

where f is the ratio or factor of the two pumps.
L_a and L_b are comparable dimensions of the two pumps.
n_a and n_b are the rotative speed of the two pumps
Q_a and Q_b are the capacities of the two pumps at comparable points on their characteristics.

The above is based on the assumption that the two pumps are proportional in every way and that the same relative degree of interior smoothness is obtained in the two pumps. This is difficult of attainment, for the actual smoothness of castings will be approximately the same irrespective of size. Thus, the relative internal smoothness of a larger pump is greater than that of a smaller pump. This is reflected in the head losses in the pump waterways so the larger pump should produce a higher head than the smaller pump for points of similar capacity. Also as part of the quantity pumped leaks thru the rings, this loss may not be in proportion in both sizes of pumps, thus affecting the net quantity delivered. Finally part of the power input goes into mechanical losses (bearings and stuffing boxes). While these mechanical losses will be roughly in proportion to the pump sizes, they will not be exactly proportional, thus resulting in a third discrepancy. In

* Reproduced from "Standards of the Hydraulic Institute—Centrifugal Pump Section," by permission of the Hydraulic Institute, 90 West St., New York City.

addition (especially in the production of a commercial line of pumps) it would not be found good mechanical design to make the shaft, casing thickness, thickness of impeller vanes, etc. of two pumps in exact proportion to their size factor. As a result it would be found in the comparison of the largest and smallest pumps of a closely homologous line of a commercial design that some difference in performance will occur and the magnitude of the difference will depend upon the size factor and the actual physical sizes of the two pumps. Centrifugal pump designers are therefore careful in making model pumps to use a size which will be close enough to the full size pump so that the results of the model will permit predicting reasonably closely the performance of the full size pump.

Model pumps have been used to prove within a reasonable degree of accuracy the performance of the full size unit for almost every case involving special large capacity centrifugal pumps built in recent years and the Test Code of the Hydraulic Institute covers the test procedure for such models.

Specific Speed

The basic definition of Specific Speed is that it is the speed in revolutions per minute at which a theoretical[1] and geometrically similar pump would run if proportioned to deliver 1 GPM against 1 foot total head with its best efficiency at these service conditions. It is therefore an index of the pump type, using the capacity and head obtained at the maximum efficiency point. It is sometimes desirable to determine the specific speed of a pump at a capacity and head other than that of best efficiency but such specific speed values should not be used as an index of the pump type.

It is desirable to consider the specific speed of a pump as a type number rather than the actual rotative speed of a 1 GPM 1 foot total head model pump because, in most cases, such a model pump, if made, would not deliver that capacity and head. For example a certain 18" discharge 20" suction double suction single stage volute pump delivers at best efficiency, 13,000 GPM 102 feet total head at 860 RPM with a 25" diameter impeller. Its theoretical 1 GPM 1 foot total head model would have a 0.56" diameter discharge opening, a 0.67" diameter suction opening, an 11/16" diameter impeller and would operate theoretically at 3050 RPM to deliver 1 GPM against 1 foot head. Such a model would be too small to give comparable hydraulic results.

The formula for determining specific speed is—

$$N_s = \frac{n\sqrt{Q}}{H^{\frac{3}{4}}}$$

where N_s = Specific Speed.
Q = GPM capacity at speed n and head H.
n = Rotative speed in R.P.M.
H = Total head per stage in feet.

The normal range in specific speeds encountered in single suction impeller designs is from 500 to 15,000 with approximate impeller profiles as indicated on Fig. 27. Basically the lower the specific speed, the higher the head that can be developed per stage by the pump.

For a given total head and suction lift condition, it has been found from experience that the specific speed of a pump should be below a certain value for successful operation. The Hydraulic Institute has issued specific speed charts, that are reproduced herewith. One, (Fig. 25) applies both to single stage double-suction pumps and to single stage single-suction pumps with a shaft through the eye of the impeller. The other (Fig. 26) applies to single stage single-suction mixed-flow and axial-flow pumps. (Both charts are based on 85°F water

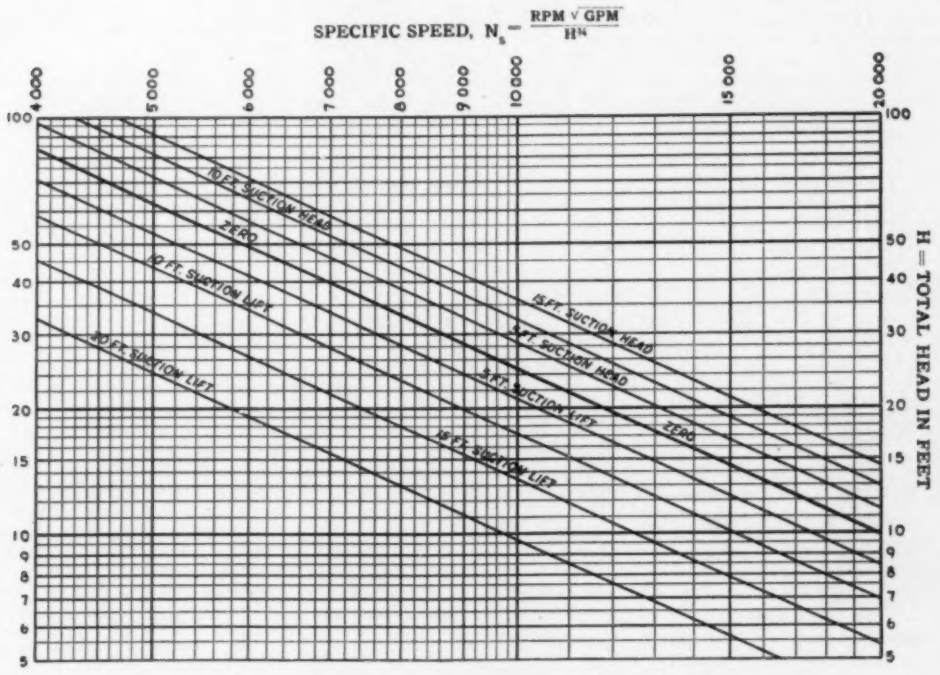


Fig. 26—Another Specific Speed Limit Chart Developed by the Hydraulic Institute.*
(This chart for single stage pumps of socalled mixed-flow and axial-flow types.)

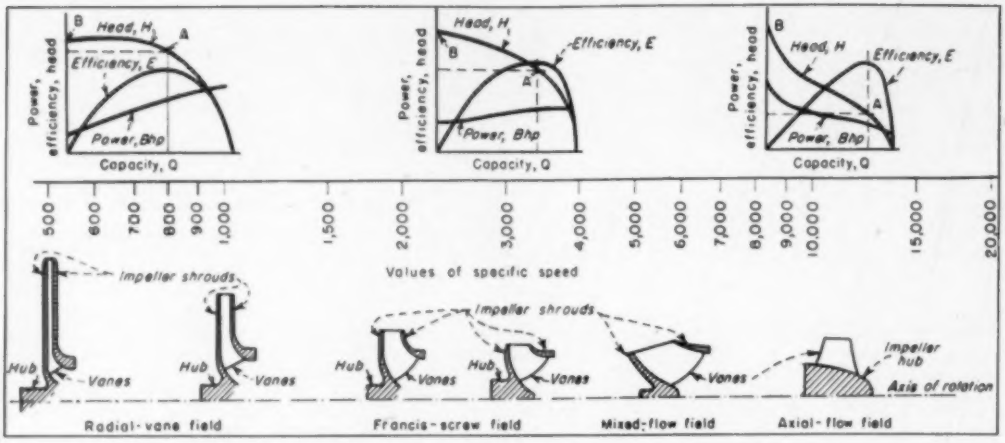


Fig. 27—Characteristics Graphs and Specific-Speed Scale for Impellers of Various Designs.

These impellers of various profiles range from lowest specific-speed radial flow design on left to highest specific-speed design on extreme right. The specific scale applies to the impeller designs below and characteristics graphs above.

at sea level. These have been generally called "Specific Speed Limit Charts." It must be realized in using these charts that pumps built for the limit allowed are not necessarily the best design for the intended service and a lower specific speed type might be more economical, as in some other way preferable. It must also be realized that the individual pump design limits its application for both maximum head and for suction condition limitations. For example the maximum recommended specific speed for a double suction single stage pump is 2130 for 200 feet total head and 15 feet suction lift. It does not follow that all double suction single stage pumps of 2130 specific speed type are suitable for operation at speeds which will cause them to develop 200 ft. total head at maximum efficiency; nor, that the pump, if suitable for operation at 200 ft. total head, is suitable for operation with 15 feet suction lift; nor, that a pump of this type operating against 200 feet total head would on test only be found capable of operating on 15 feet maximum suction lift. These charts are intended to indicate only the maximum rotative speed which experience has so far shown a centrifugal pump can be designed with assurance of a reasonable and proper operation for the anticipated combination of operating conditions. Nothing on these charts suggests that the specific speed indicated corresponds to the point of maximum operating efficiency. Pumps are normally chosen on the basis of providing a design which will operate near their maximum efficiency points. Thus even though the service conditions do not correspond with the design conditions the specific speed value is sufficiently close to the specific speed of the design conditions. For example Fig. 24 shows the characteristics of a 6" pump whose maximum efficiency is at 1480 GPM 132 ft. total head 1760 RPM and thus the *true* specific speed is 1740. This pump would normally be applied for a range of 1300 GPM 140 ft. total head to 1600 GPM 125 ft. total head, a range of specific speeds of 1590 to 1890, which varies about 10% from the actual type N_s.

No attempt should be made to compare pumps on the basis of their specific speeds except for their design conditions. The reason for this is apparent when it is noted that every centrifugal pump has specific speed values from 0 to infinity, as illustrated in Fig. 24, depending upon the particular point on the head capacity curve selected.

On Fig. 27 there is shown the type characteristics of a low specific speed pump, a medium specific speed pump and a high specific speed pump to illustrate how the shape of the pump characteristics change with impeller type. This is the major reason for the differences in the shape of pump characteristics. Some variation in the shape of the curves can be obtained in the design of the impeller and casing water ways, but the variation that can be thus obtained without adversely affecting the efficiency is relatively small.

Aultman Becomes Asst. Director Miami Dept. Water & Sewers

On August 1st, Wm. W. Aultman of LaVerne, Calif. will become Asst. Director of Miami's Dept. of Water and Sewers, as understudy to Wm. A. Glass, Director.

Mr. Aultman has served the Metropolitan Water District of Southern California for 21 years as chemist and Supt. of the District's Water Softening and Filtration Plant, located at LaVerne, Calif. He has long been a member of the Am. Water Works Assn. and one of the "wheel-house" officers in its Water Purification Div. He is well known for his investigative work in water softening with lime and zeolite and his study of electrolytic softening and production of potable water from sea-water. He has done a vast amount of committee work and has published a number of valuable articles.

When Florida can entice a Southern Californian away from his happy habitat that's *news*—also, evidence that bigger things are ahead for "Bill" Aultman.

TRIUMPH!

The explanation of triumph is all in the first syllable—regardless of how it's spelled.

Unaccounted-for-Water*

How it is Correctly Determined and Why Percentage Figures Can be Misleading

by HOMER E. BECKWITH, *District Mgr., The Pitometer Co., Pittsburgh, Penna.*

"UNACCOUNTED-for-Water"—exactly what do we mean by this term?

To a dozen different people it can mean a dozen different things. For instance, to one man it may mean the difference between the total input to the system as shown by his master meter and the sum of the meters through which water is sold. Another may want to add to the amount of water sold items such as estimated public use, water used to fight fires, sewer flush water, estimated meter slip, etc., etc. Sometimes even the kitchen sink slips into the accounting. But it is because of this wide divergence in methods for computing "unaccounted for water" that far too often we find that we are not talking about the same thing.

For the above reason I wish to propose a new term—"Metered Ratio." This would be defined as the percent of the total water entering the system that is shown as registration on all meters on the system—those of customers and other meters. Thus reduced to the simplest essentials, we have a term which would mean the same wherever used. When we have such a uniformity we will be able to collect data which will have meaning. I claim no patent on this idea as Wendell R. Ladue, former president of the American Water Works Association, has been preaching this gospel for some time. I am just beating the drum in the hopes of bringing in more converts to this meaningful and realistic term.

Only too often the operator starts out with a preconceived idea of what his percentage of accounted for water should be. If he finds that his records do not produce this preconceived figure, he may juggle his items until he gets an answer that does conform with what he thinks it should be. In an exaggerated case the writer once saw an accounting which showed that, on an annual basis 3,000,000 gpd were used to fight fires out of a total pumpage of 17,000,000 gpd. Later investigation showed, of course, that this figure was wide of the mark.

So let us start off on a basis which admits of no misunderstandings. Let us assume that only the water shown on the customers' meters is accounted for—that is, the "metered ratio" and the percentage of "water accounted for" are identical. We can then study the factors which contribute to the "unmetered" or "unaccounted for" water.

When Must We Start?

To start at the beginning, we must accurately know the amount of water entering the system. This should be measured by master meters at the pumping station or filtration plant. If the filter wash water passes through the master meters and is thus recorded on them, the amount of this wash water should be carefully recorded and subtracted from the master meter readings. This filter wash water is part of the material expended to produce the plant output available for sale and is really just as much a part of the production cost of the finished water as are coal, electricity, or chemicals. The temptation to include filter wash water in the total figure for water produced in order to hold down the unit cost is understandable, but if we are to ever get figures which mean anything we must use the same basis in all instances. Since not all plants filter their supply the only true basis for arriving at comparable results from system to system is to use as the base the amount of water entering the system after all plant uses are deducted.

Having decided on a basis for determining the amount of water to be accounted for, we must next be certain that our determination of this amount is correct. At present the usual method for measuring this amount is by the use of Venturi type meters, orfice plate meters, turbine type meters, pitot tubes, etc. Any of these meters will give reliable measurements if correctly installed, checked for accuracy, and properly maintained. No meter can be installed and then forgotten. Any piece of equipment needs checking from time to time—even such a rugged piece of mechanism as a Venturi meter. Not only should the recording portion be checked but the tube as well. Anything which disturbs the area ratio between the throat and pipe at the points where the pressures are taken will cause a false reading. Incrustation growing over the throat or stones or other foreign matter working down into the throat are examples of conditions which have been found to cause false readings. For this reason, it is desirable to not only check the instrument by using the standard tests outlined in the instructions which come with the meter, but from time to time it may be well to make tests by comparative measurements using some other instrument such as the Pitot tube.

Practical Limitations in Water Accounting

Not even in the best maintained systems is it possible to register on the consumers' meters all the water entering the system. Not even all of the water which reaches the consumer is shown on the consumers' meters. This is because meters begin to deteriorate from the time they are set and inevitably there are always some meters in the average system which are running somewhat slow—especially so on the minor flows which too frequently do not register at all. Moreover, even with new meters, it is practically impossible to catch the drip flows. The inertia of the moving parts of customers' meters is usually sufficient to permit the very small amount of water feeding dripping faucets to slip past without moving the meter. The amount from each individual drip is insignificant enough; but, taken as a whole for the entire system total lost registration from these small individual seeps is considerable, possibly as much as 5% of the total pumpage in an average system and assuredly more where meter maintenance is neglected.

* This paper, presented before the Virginia Section of A.W.W.A., has been released for publication in *Water & Sewage Works.*

Large commercial and industrial meters often under-register the water passing through them, sometimes because the meter is worn, but often because the meter is improperly chosen as to size and type for the particular job it has to do. Or it may be improperly set. Meter manufacturers are only too glad to cooperate with their customers in selecting the proper type of meter and in securing the proper setting. It is wise to avail one's self of this help.

From what I have been told, all meters are not equally sensitive. On this subject I cannot speak with authority but it seems natural to suppose that one gets only the quality one pays for, and one cannot expect as high a percentage of registration from meters purchased on a price basis as can be expected from meters purchased on a quality basis. The amount of flow required to start a meter operating (its sensitivity) has an appreciable effect on "accounted for" water.

The time interval between readings is also a contributing factor. Not only can meters turn over if too much time elapses, but stopped meters are not caught so soon and the amount of under-registration accordingly is increased.

Indifferent Maintenance

Only too often meters are permitted to operate until they stop completely before they are brought in for test or repair. As most meters start to under-register some time before final failure, neglect in meter maintenance is bound to contribute to the increase in the amount of "unaccounted for" water on any system where such neglect exists. A much better plan is to bring meters in systematically, say at the end of some specified period, possibly five or six years, for test and overhaul even though they may still appear to be functioning properly. Some operators prefer to base the test period upon the amount of flow registered by the meter, instead of upon the less significant elapsed time in service. There is a great deal to be said for this position, but probably the ideal set-up would be a combination of the two—*so much registration or so much time*, whichever comes first. Too much emphasis cannot be placed upon proper meter maintenance if the desirable high "metered ratio" is to be obtained. Nor should we forget that the meters are looked upon as "the cash register" (more properly the scales) of the water works industry and money is as necessary in this as in any other branch of business enterprise.

The "Free Water" Racket

Then there is the "free water" racket. Too frequently charitable institutions, churches, schools, parks, playgrounds and public buildings are given water service without charge. Perhaps the real weakness of this situation lies not so much in the fact that the water is free but that no effort is made to control its waste. It is a human trait to value lightly anything which is free. A much more realistic approach to this problem of free water is to meter all such services, so that a check is had on the amount of water used. Then, if necessary or desirable, give a reasonable amount of water as a contribution. But when the meter registration shows that the privilege is being abused, through waste or otherwise, a charge should be made for the excess registration. Nothing increases our appreciation of any article or service as much as having to pay for it.

Nor should the sewer department be permitted to turn the flow from fire hydrants into sewers with such gay abandon. There is something about the sound of running water which is very relaxing to the human ear. The temptation to shove a fire hose down the end of a sewer and sit in the shade of a convenient tree listening to the sound of rushing water is often too great for the members of the sewer flushing crews to resist. The result is that these flows are often permitted to continue long after the sewer has been fully flushed. The use of a portable meter to measure all water used for sewer flushing should be required as a deterrent to wasteful practices. I know such meters cost money but so does the water now carelessly wasted. In the long run, the meter will prove to be the less expensive of the two.

Another occasional contributor to water losses is the unmetered fire line, and the unauthorized connection. Most people are honest but there are enough of the other kind to make it necessary to keep a watch upon all places where surreptitious connections can be made. It even happens occasionally that honest persons inadvertently make connections to unmetered lines.

Those Hidden Leaks and Seeps

Then there is another type of loss which increases the spread between the pumpage and the sales. This is the underground leak. The leak which shows upon the surface is quickly located and repaired, but the loss which occurs between the inception and the repair of the leak is a part of the "unaccounted for water" we are discussing. However, the leak which does not show on the surface and continues to waste water day after day, week after week, month after month, and even year after year, contributes an amount which is only too often underestimated. No distribution system is bottle tight. A certain amount of water is inevitably lost from small seepages at the joints. Even if the exact location of each and every one of these small leaks were known at present day labor costs it would cost more to dig them up and repair them than to permit them to continue to exist. The amount of loss from these seeps will vary from one system to another and will depend a great deal upon the nature of the soil, type of joint, etc. The larger the average diameter of the pipe in the distribution system the higher will be the loss from this source. For cities of average size, a figure of 3,000 gallons per day per mile of main should not be far from the mark. For larger cities the figure will be a bit higher.

But in most cities there are a number of underground leaks which waste an appreciable amount of water. The location and repair of these leaks can materially reduce the amount of "unaccounted for water." The cost of locating and repairing such leaks is often only a fraction of the value of the water being wasted.

Within the memory of a great many of us here today, the typical water plant pumped water by steam power either from wells or large surface supplies directly into the distribution system without purification of any kind. Or the water may have flowed by gravity from impounding reservoirs without any pumping costs whatever. Under those circumstances it was difficult to see that water had any particular value. Even when pumped, a small increase in waste caused no measurable decrease in the amount of coal thrown under the boiler. But now things are different. Water is a manufactured product. Every gallon requires filter capacity and its quota of chemicals. Even our power units have largely changed. Electric power has replaced steam in an increasing number of plants. The result is that the cost of pumping is influenced even by small changes in the amount of water handled. Right now with output often equalling or even exceeding the rated theoretical capacity of our plants, water has a value far beyond that of the chemicals and power which are required for its production. Costs of capital equipment must also be considered. A water department which could decrease its load

from 10,000,000 gpd to 9,000,000 gpd would automatically reduce its need for plant capacity by 1,000,000 gpd. If the plant requires a margin of safety, the reduction in required capacity would even exceed 1,000,000 gpd. The capital value of this saving in filter capacity, pumps, settling basins, etc., would probably be not far from $200,000.00 at present prices. This may be somewhat beside the point of this paper, but it does emphasize the fact that when we are discussing "unaccounted for water" we are also talking about important money.

Many Conditions to Evaluate in Comparing Systems

It will be readily seen from the previous discussion that many things contribute to this item of "unaccounted for" water. And not all of these factors affect all plants in the same way. Meter quality and maintenance will vary from plant to plant and underground conditions which control the amount of leakage will not be the same everywhere. Moreover, a little reflection will show that the amount of meter non-registration on drip-rate flows will depend upon the number of meters and not upon the amount of water taken through the meters. That is, the loss will be more a factor of the number of persons served than it will be of the gallons of water consumed by those persons. The amount of water lost from seeps will depend much more upon the mileage of main (number of joints) than it will upon the amount of use from that main. An average mile of 6" main from which 5,000 gpd is taken by consumers will lose as much by seepage as a mile of 6" main from which 20,000 gpd is taken. In the first case the unaccounted for water percentagewise will be four times that in the second case. So percentages are not too reliable an index unless applied to each particular plant based upon the history of that plant. The speaker recalls two neighboring plants where intensive efforts were made to reduce the "unaccounted for water." The final result was that one plant achieved a "metered ratio" of 88% while its neighbor only achieved a ratio of 72%. However, in the first plant the per capita use of water was 90 gallons per day and in the second plant it was 40 gallons. It will be seen that in each case the per capita loss was about 11 gpd. This was to be expected as the underground conditions were similar and the number of consumers per mile of main was about the same. The principal difference lay in the fact that one system had a large industrial load and the other had practically none.

It can be readily comprehended that what may be a very satisfactory "metered ratio" in one plant would be highly unsatisfactory in another. The only way to find out what it should be on each individual plant is to make an intensive campaign to eliminate preventable waste from all sources. When this has been done, the resulting metered ratio should be the correct one for that particular plant and should serve as a yardstick by which to measure future performance.

Geo. C. Naylor

Vernon Corle

Four Pennsylvanians Upped by Amer. Water Works Co.

Within recent months four changes in managership have been made of the Pennsylvania Division operating companies of the Amer. Water Works Co.

Earl C. Schwalm has been changed from manager of the Riverton Consolidated Water Co. at Lemoyne, to manager of the Warren Water Co. George C. Naylor, manager of the Westmoreland-Vandegrift division, at Apollo, has been made manager of the Riverton-Consolidated, while Vernon B. Corle, former manager of the Westmoreland Water Co., at Greensburg, has gone to the City of New Castle Water Co., as manager. J. Lepere Mathews, former manager of New Castle, is now manager of the Municipal Authority of Westmoreland County. Clarence C. Arbogast, formerly manager at Warren, took over the managership of the Ashtabula (Ohio) Water Co., succeeding Robert S. Johnson, who retires after 34 years of service.

Materials Chief Cost in Water and Sewage Works

Labor Costs One-Third

According to a study by the U. S. Bureau of Labor Statistics, and the U. S. Pub. Health Service, materials are approximately 40 to 50 percent and labor a little over 30 percent of the cost of building new water and sewer systems. Engineers' reports on a sample of 200 projects built in 1948, 1949 and 1950 provide the basis for a distribution of expenditures per million construction dollars, for the labor, materials, and supplies needed to build these projects, and for overhead, profit, and equipment charges.

Materials accounted for half the total expenditures for building new water works, and the proportion was the same for either treatment plants or distribution lines. One-fifth of all outlays for water treatment plants was spent for key metal products (chiefly pipe and fittings and reinforcing steel), 15 per cent for metal-using machinery and equipment to operate the treatment process, and 10 per cent for premixed concrete. A third of the cost to build the distribution lines was for metal products, largely pipe and fittings, and about 10 per cent for cement asbestos pipe and other stone, clay, and glass products.

Materials costs for new sewer works were somewhat less than for water supply systems, amounting to over two-fifths of total outlays. Labor costs were about the same as for water works, however—a little over 30 per cent. Unlike the water supply systems, there was much less expenditure on sewage disposal systems for the presently critical metal products, and much more for cement, clay, and stone products. This reflects primarily the use of clay and concrete pipe on sewage lines instead of the metal pipe and fittings most prevalent in water lines.

A substantial amount of sewage treatment plant construction expense was for machinery and equipment to operate the works, an item that is very minor in the case of the sewage collection lines. Other materials expenses were fairly similar for the 2 parts of the sewage disposal system.

On account of the deeper and more extensive excavation needed for installation of sewers, charges for the use of construction machinery were a much more significant item of expense for construction of sewage collection lines than for any of the other parts of the water supply and sewage disposal systems.

> You'll never lose your shirt by rolling up your sleeves.

Purification Division Sessions at AWWA Conference

A Report
by HARRY A. FABER*, *Editorial Associate, Water and Sewage Works*

THE Water Purification Division of the AWWA held three busy sessions as a part of the 71st Annual Conference in Miami, April 29-May 4, 1951. This reporter found every technical paper, discussion, and committee report comprising the program to be of particularly timely interest.

Dr. A. E. Berry, President Elect of the Association was Chairman at the first session of the Division, assisted by Messrs. Lordley and Derby. H. E. Lordley, Asst. Dir., Pub. Util., Richmond, Va., retiring Chairman of the Division, presided at two sessions, with Messrs. Derby, Henry, Hartung and Black as assistants.

Dr. A. E. Berry
Chief San. Engr.
Ont. Dept. With
Toronto, Ont.

H. E. Lordley
Asst. Dir.
Dept. Pub. Util.
Richmond, Va.

R. L. Derby
Prin. San. Engr.
Dept. Wat. & Pow.
Los Angeles, Calif.

C. R. Henry
Ch. Chem.
Dept. Wat. & Sew.
Miami, Fla.

H. O. Hartung
Prod. Dept. Engr.
St. Louis Co. Wat. Co.
Univ. City, Mo.

C. A. Black
Cons.
Black Lab.
Gainesville, Fla.

Presiders at Sessions

New Officers Elected

The Division elected new officers in a brief business meeting held during its last session. Those elected are:

Chairman—H. O. Hartung, Asst. Gen. Mgr., St. Louis County Water Co., St. Louis, Mo.

Vice Chairman—R. L. Derby, San. Engr., Los Angeles Water and Power Dept., Los Angeles, Calif.

Secy.-Treas.—Martin E. Flentje, San. Engr., Amer. Water Works Service Co., Philadelphia, Pa.

Directors—W. W. Aultman, Water Purif. Engr., Metro. Water Dist., LaVerne, Calif., and Wm. Yegen, Supt. of Filtration, Bismarck, N. D.

Technical Program

The program of the Division included seven technical papers, three committee reports, and a panel discussion.

*Research Chemist, The Chlorine Institute, Inc., New York, N.Y.

Keeping Copper in Solution

"SOLUBLE COPPER SALTS FOR WATER TREATMENT" by Marsden C. Smith, Chief Water Engineer, Dept. of Public Utilities, Richmond, Va.

Decrying the limited amount of factual information regarding copper compounds as algacides, Mr. Smith reported on experience in Richmond. Only partial success attended early methods of application which involved copper sulfate treatment of water in coagulation basins kept out of service during the treatment; applying copper sulfate in pretreatment with subsequent coagulation and chloramine treatment; and finally, the application of copper to filtered water prior to aeration.

Mr. Smith, who is not given to wild claims, stated Richmond experience demonstrates absolute control of algae can be accomplished with 1 ppm. copper in the form of cupri-chloramine. He referred to the work of Harold (Metropolitan Water Board, England), first to develop the term and to use the process. Dr. White (Univ. of Maryland) says it is entirely possible to form this compound at high pH values and thus to maintain copper in solution.

The relative amounts of chemicals held in solution at Richmond are: copper, 0.25 ppm; chlorine, 1.74 ppm; and ammonia, 0.3 ppm. The chemistry of cupri-chloramine is complex and not yet well established. It was suggested that algae may be responsible for more difficulties in water distribution systems than is generally realized.

In the discussion following this paper, H. O. HARTUNG, St. Louis County Water Co., asked if the copper content of the water had resulted in increased attack on galvanized hot water tanks. Mr. Smith said this had not been the case, and that theoretically water so treated should be more stable.

A. P. BLACK, Head, Dept. of Chemistry, Univ. of Florida, noted that copper appeared to be returning to the early esteem in which it had been held. The mixture known as "Cuprose" (sodium citrate and copper sulfate) remains in solution best in the presence of alkali.

H. E. LORDLEY, Richmond, Va., noted that stainless steel equipment for feeding and dissolving copper sulfate is required in a permanent installation. Color standards are available for copper determinations.

Continuous Odor Testing

"CONTINUOUS ODOR MONITOR AND THRESHOLD TESTER" by H. H. Gerstein, Chief Filtration Chemist, Dept. of Public Works, Chicago, Ill.

The equipment developed and described by Mr. Gerstein not only provides a quick means for determining the type and intensity of an odor in water, but also makes possible a frequent check on the efficiency of the treatment process.

In the device illustrated, water is passed continuously through an electric heater (to maintain its temperature at 120° to 140° F.) and is then atomized by discharging through a spray nozzle inside a closed glass cylinder. The odor released can be sniffed by an operator through an opening in the cover of the cylinder; a glass Osmoscope aids in odor detection.

For making "quick and fairly accurate" determinations of odor threshold values on a continuous basis, there is

an auxiliary device. This employs rotameter flowmeters to measure the rate of flow of water to be tested and of odor-free dilution water, and enables calculation of the T-O value on the basis of dilution. Exclusive of labor, cost of the odor monitor was reported to be less than $75; and of the threshold tester, less than $100. (Note: The paper by Mr. Gerstein has been published in full in the May issue of the AWWA Journal.)

Removal of Radioactive Substances

"STUDIES ON THE REMOVAL OF RADIOISOTOPES BY WATER TREATMENT PROCESSES" by Rolf Eliassen, Prof. of Sanitary Engineering, and W. J. Kaufman, J. B. Nesbitt, and M. I. Goldman, Research Assistants, Mass. Inst. of Technology, Cambridge, Mass.

Professor Eliassen presented detailed data on a complex subject in his usual clear and forceful manner. Laboratory and pilot plant research studies demonstrate the removal of radioactive phosphorus from water by coagulation and filtration exceeds 99 per cent—but the residual radioactivity remaining in the treated water varies considerably. Good coagulation is required (filtration is simply to remove floc particles) and the requirements were described.

Conditions which gave excellent removals of the phosphorus accomplished only fair removals of radioactive strontium and no removal of radioactive iodine. These comparative removals emphasize the fact that the removal of radioactivity from a contaminated water depends upon the chemical or ionic form in which that radioactivity appears.

Mr. Kaufman used lantern slides to illustrate details of the coagulation studies in which ferric sulfate and clay were used for coagulation of three different waters (Boston supply, Ohio River, and Scioto River), and lime-soda softening was investigated.

Discussion of the paper was presented by ARTHUR E. GORMAN, San. Engr., Div. of Eng., Atomic Energy Comm., Washington, D. C., and by H. GLADYS SWOPE, Argonne National Lab., Chicago, Ill.

Mr. Gorman noted that research on the removal of radioactive substances from water has also been conducted at Oak Ridge laboratories and may soon be released. He pointed out that the results reported by Eliassen et al do not involve particulate matter or mixed fission products. The latter may be especially long-lived and thus be of significance in the disposal of sludges. Studies do indicate that mixed fission products can be removed from water by ion exchange filtration, and in the event of need, data of this nature would be made available promptly.

Miss Swope also emphasized the long half-life characteristics of many isotopes which might be present if mixed fission products should contaminate a water supply.

Laboratories Need Instruments

"INSTRUMENTATION IN THE MODERN WATER PLANT LABORATORY" by S. K. Love, Chief, Quality of Water Branch, U. S. Geological Survey, Washington, D. C.

Greater speed and greater accuracy in analyses can result through the use of laboratory instruments, and this is recognized by their use in an increasing number of water works laboratories; but the increase is very limited. Despite the time- and money-saving features of modern instruments, Mr. Love could cite reasons why more laboratories have not adopted more equipment of this type: Lack of knowledge concerning the suitability of such instruments in water plant laboratories, or of technical personnel to operate and maintain them; initial high cost of the instruments and inability to convince budget authorities of the return from such an investment.

Mr. Love described in some detail ten instruments particularly suitable for use in the average water plant laboratory, describing their application and approximate cost. The colorimeter, conductance bridge, filter photometer, pH meter, residual chlorine titrator, and turbidimeter instruments range in cost from $50 to $250. The constant load type balance, flame photometer and spectrophotometer range in cost from $700 to $1500. A recording radioactivity monitor will cost from $600 to $2500.

Without deprecating instrumentation, it was pointed out that these devices are neither fool-proof nor a substitute for brains. They will require adjustment, expert repair, and competent supervision. However, the efficient use of instruments enables a laboratory to provide maximum service.

JOHN R. BAYLIS, Engr. of Water Purif., Bureau of Water, Chicago, Ill., presented a prepared discussion of this paper. He contrasted the cost of laboratory equipment provided in 1926 for the experimental filtration plant of Chicago, about $550, with that now available in the laboratory of the South Side Filtration plant, over $5,000. To a long list of more usual laboratory instruments there is added, in the latter laboratory, amperometric titrator, lumitron, photelometer, spectrophotometer, flame spectrophotometer, electron microscope, radioactivity counter, odor monitor, residual chlorine recorder, and many others. In this plant, at least, the applicability of modern instruments is recognized.

In the discussion which followed, A. S. BEHRMAN, Cons. Chem. Engr., Chicago, questioned the possible use of electron microscopes for speeded-up bacterial culture studies. R. L. DERBY, Dept. of Water and Power, Los Angeles, reported promising results in studies of a microfilter used with selective coliform media in a direct count technique. ROLF ELLAS-

M. C. Smith
Ch. Wat. Engr.
Dept. Pub. Util.
Richmond, Va.

H. H. Gerstein
Ch. Filt. Chem.
Dept. Pub. Wks.
Chicago, Ill.

Speakers

W. W. Aultman
Wat. Pur. Engr.
Wat. Dist. So. Calif.
Laverne, Calif.

A. P. Black
Hd. Dept. Chem.
Univ. of Fla.
Gainesville, Fla.

J. E. Kerslake
Supt. Filtr.
Wat. Purif. Plant
Milwaukee, Wis.

C. M. Hoskinson
Ch. Engr. & Supt.
Div. Wat. & Sew.
Sacramento, Calif.

SEN, M.I.T., noted that the small field examined under an electron microscope would, statistically, invalidate its use for evaluating bacterial numbers.

It was evident that the audience was interested in equipment available for monitoring the radioactivity of waters. Miss Swope stated no low level device for this purpose is available. Several manufacturer's representatives discussed technical points, mainly that *continuous* monitoring equipment is indicated for the purpose, but that none is even designed. They emphasized the need of cooperation between water works technicians and equipment manufacturers in order to provide suitable radioactivity devices.

The studies further showed filtered water should be used for backwashing; best results to date indicate backwashing requires about 1 per cent of the water filtered. If activated carbon is employed (in a size small enough to remove tastes and odors), filter runs are materially shortened. Bacterial removed by diatomite units is not dependable (if coarse filter aid is used), and means for disinfection should be separately provided.

Of particular interest was the relationship developed by Mr. Sanchis—for Los Angeles conditions—between conventional (rapid sand) filtration and diatomite filtration. The ratios reported between conventional and diatomite filtration were: space requirements, 10 to 1; first cost, 3 to 1; chemicals or filter aid, 3 to 4; chemicals or filter aid plus activated carbon, 1 to 3; and personnel and maintenance 3 to 4.

Mr. Black briefly reviewed development of the U. S. chlorine industry, noting that 3.5 per cent of the total production is used for sanitation—including both water and sewage treatment. Cylinder chlorine is used by the majority of Florida water treatment plants and the delivered cost is 12.5 to 13.5 cents per pound. Cost of chlorine in ton containers, as used by several large plants, is 8.0 to 9.5 cents per pound; the delivered cost at the city of Orlando is 8.0 cents.

During 1950, Orlando Utilities water plant used 69 tons of chlorine and the Orlando City sewage plant 72 tons; total chlorine 141 tons, total cost $21,150.00. On the basis of estimated water consumption and sewage flow, and assuming proportional use of chlorine at current prices, in 1955 the total chlorine will be 205 tons, total cost $32,800.00. Because of apparent shortages and cost increases, the Utilities Commission directed an investigation "to determine the feasibility of constructing a small chlorine plant in connection with their present water and power facilities."

Methods of chlorine manufacture were investigated, comparative production and maintenance costs were determined, plant design was indicated, and construction costs were estimated. The estimates show a plant to produce 1 ton of chlorine and 1.2 tons of caustic soda per day would cost about $216,000. Production costs would total about $84 per ton of chlorine, or 4.2 cents per pound of chlorine.

The plant considered would be housed in an addition to the existing chemical house of the water plant; it would provide 24 diaphragm type cells, chlorine liquefaction and storage, ton container filling equipment, hypochlorite production facilities, and evaporators for reclaiming salt and purifying caustic. The estimated costs do not include amortization and depreciation, but the estimated production cost of chlorine indicates "the

R. Eliassen
Prof. San. Engr.
MIT
Cambridge, Mass.

A. E. Gorman
San. Engr.
At. Energy Comm.
Washington, D.C.

Radioactivity

H. Gladys Swope
Chemist
Argonne Nat. Lab.
Chicago, Ill.

S. K. Love
Ch., Qual. Br.
U.S.G.S.
Washington, D.C.

E. S. Hopkins
Prin. Assoc. Engr.
Dept. Pub. Wks.
Baltimore, Md.

Analytical Instruments

J. R. Baylis
Engr. Wat. Purif.
Dept. Pub. Wks.
Chicago, Ill.

Diatomite Filter Progress

"FURTHER RESEARCH IN DIATOMITE FILTRATION" by Joseph M. Sanchis, San. Engr., and John C. Merrell, Jr., San Engr. Assoc., Dept. of Water and Power, Los Angeles, Calif.

Illustrated throughout with excellent lantern slides, the paper presented by Mr. Sanchis showed the progress made in construction and operation of this relatively new type of water filter. Diverse methods employed to apply the precoat, and advantages of continuous precoat feed, were described in detail. These experimental studies employed several standard models of commercial diatomite filters.

Dissolved and entrained gases in the applied water caused air binding, but this was not troublesome when a slight back-pressure was maintained. The character and quantity of turbidity determines the size of diatomite most suitable — low turbidity and high plankton concentration in the San Fernando water made possible the satisfactory use of a coarse media. One new development is a method for determining the continuous or "body" dosage: jar tests cannot be used, but a miniature filter unit quickly provides necessary data.

JOHN E. KIKER, Prof. of San. Eng., Univ. of Florida, Gainesville, Fla., presented discussion further evaluating diatomite filtration. Each water supply presently requires special study to develop the best operating procedure; the high cost of diatomite or other filter aids is a disadvantage; and a greater degree of skill is required of filter operators.

In reply to a question by H. E. HUDSON, State Water Survey, Urbana, Ill., Mr. Sanchis reported that carbon in the precoat proved of little value and that a contact period was found essential to make carbon effective. C. H. SPAULDING, Urbana, Ill., discussed studies of diatomite filters handling coagulated and settled water; runs of 30 hours at a 5 gal. per sq. ft. rate were obtained.

Chlorine Production Possibilities

"STUDIES IN LOCAL PRODUCTION OF CHLORINE" by Charles A. Black, Black Laboratories, Inc., Gainesville, Fla.

investment can be amortized in a period of from six to ten years and at the same time make available to Orlando the critical products which are difficult to obtain."

C. M. HOSKINSON, Chief Engr. and Supt., Div. of Water and Sewers, Sacramento, Calif., recalled interesting details of experience in the production of chlorine at the Sacramento filter plant during the period February 1924 to May 1930. The high cost of commercial chlorine (then about 13 cents per pound in 150 lb. cylinders) was the reason for manufacture of chlorine at the plant. While records are not available, it is believed the "homemade chlorine" (not liquefied) costs between 6 and 7 cents per pound. 54 gal. of fuel oil is required to calcine one ton of lime. A tower scrubber is employed to control dust; spray nozzles wash the stack gases 99 per cent free of dust. The stack gases provide carbon dioxide for recarbonation of water in the treatment plant.

A net operating profit of $169,000 was realized for the fiscal year 1949 to 1950. Total operation costs of the lime reclamation plant were $115,852 and net costs were $94,385 (reduced by outside sales of lime amounting to $21,467). When interest and depreciation are added to the net cost, the lime used for softening at the Miami plant actually cost $8.25 per ton, as against a purchased lime cost of $19.60.

C. F. Wertz
Res. Engr.
Dept. Wat. & Sew.
Miami, Fla.

A. J. Fischer
Asst. Mgr.
Sew. Dept.
Dorr Co.

H. V. Pederson
Supt.
Wat. Wks.
Marshalltown, Iowa

Lime Reclamation

A. S. Behrman
Cons.
Chem. Engr.
Chicago, Ill.

D. B. Williams
Supt. Purif.
Water Works
Brantford, Ont.

E. A. Schmitt
Hd. Engr. & Chief
Wat. Sup. Div.
Washington, D.C.

Non Scheduled Discussors

Early operating difficulties were considerable and necessitated replacement of the cells by new ones made locally. Maintenance, cleaning, repairs, and replacement of parts were required about every 30 days. While good equipment is now available, any chlorine plant requires experienced mechanical and electrical maintenance at all times in addition to common labor. Present cost of commercial chlorine at the Sacramento plant is about 5.4 cents per pound in ton containers.

Sludge: Problem into Profit

"LIME RECLAMATION AT THE MIAMI SOFTENING PLANT" by C. F. Wertz, Resident Engr., Dept. of Water and Sewers, Miami, Fla.

In his comprehensive paper, Mr. Wertz explained why the reclamation of lime from the Miami plant is particularly successful: the water supply is from wells (no turbidity) and is very low in magnesium content (calcium 90 ppm., magnesium 7 ppm.). The engineering estimate of plant cost was $350,000 and the actual cost was $792,000.

The plant equipment includes sludge thickeners, vacuum filters, and centrifuge preceding the kiln. About

H. V. PEDERSEN, Supt., Water Works, Marshalltown, Iowa, and ANTHONY J. FISCHER, Asst. Mgr., Development Dept., The Dorr Co., Stamford, Conn., discussed the paper.

Mr. Pedersen reviewed ten years of trial and effort which led to the perfection of a perpendicular spray dryer for lime sludge. Developed primarily to dispose of waste sludge, the equipment is operated six 12 hour days each week and reclaims calcium carbonate of 90 to 98 per cent purity. The cost of the lime is determined by the fuel burned for calcining.

Mr. Fischer described and illustrated a new method of lime recovery, termed the Fluo-Solids system, developed by the Dorr Co. A large scale test unit has been studied at Lansing, Mich., 1848 to 1950, and improvements have been made in equipment design. The method involves centrifuging and then mixing the thickened sludge with dry sludge; the mixture is sent successively to wet and then to dry cyclones; and finally to the calciner, operated at a temperature of 1650° F.

Supplementary tests of the equipment have been made and the design can be expanded to 50 tons per day capacity. A 40 ton per day plant using this system is estimated to cost $400,000. Where purchased lime costs $14 to $15 per ton, it is considered that a 15 to 20 ton per day recovery plant represents the break-even point.

Purification Plant Waste Disposal

"DISPOSAL OF PURIFICATION PLANT WASTES — COMMITTEE REPORT" by W. W. Aultman, Water Purif. Engr., Metro. Water Dist., La Verne, Calif., and A. P. Black, Head, Dept. of Chem., Univ. of Fla., Gainesville, Fla.

Mr. Aultman presented in this report only developments which have occurred since the preceding report of the committee in 1949. The nature of the disposal problem remains the same, but it has steadily become more severe because of population increases and the growing load of pollution in receiving streams.

New information has become available concerning the disposal of brine from cation exchange water softeners, and from lime and lime-soda softening processes. Operating results should soon provide details regarding the Daytona Beach sewage treatment plant which utilizes lime softening wastes (from the water treatment plant) as the chemical coagulant. Calcining kilns for disposal of softening plant sludges are still considered in the experimental stage, and the economy of operating such units in small water plants is questionable.

Chemical Specifications

"SPECIFICATIONS FOR WATER TREATMENT CHEMICALS — COMMITTEE REPORT" by James E. Kerslake, Supt. of Filtration, Water Purif. Plant, Milwaukee, Wisc.

The committee, of which Mr. Kerslake is chairman, has completed detailed specifications for eleven water treatment chemicals and is in the process of preparing seven more. Preparation of these specifications involves coordination of data, selection

of a referee, editing, criticism by manufacturers who provided information, re-editing, and publication in the AWWA Journal.

All criticisms of the published specifications will be considered when preparation of the entire list has been completed, and will be incorporated in revising and rewriting new specifications.

Report on Standard Methods

"STANDARD METHODS FOR THE EXAMINATION OF WATER AND SEWAGE—COMMITTEE REPORT" by Ray L. Derby, Prin. San. Engr., Dept. of Water and Power, Los Angeles, Calif.

Mr. Derby, Chairman of the Committee, mentioned that the revision of Standard Methods was progressing under some pressure in order that the 10th edition could be prepared for publication. His brief comment concerning new and improved methods to be presented indicated there will be marked improvement evident in the various methods. A few of the many items of this nature are: inclusion of a method for specific conductance determination; provision of alkalinity nomographs; new residual chlorine and chlorine demand methods, and the effect of free chlorine on all tests.

It was recommended that this committee and its sub-committees be kept active so that methods and procedures will be under continuous review. Succeeding editions of Standard Methods can thus be expedited and can include up-to-date methods.

Progress in Fluoridation

"FLUORIDATION PRACTICES—PANEL DISCUSSION"—Jerome Zufelt, Moderator, Supt., Board of Water Commrs., Sheboygan, Wis.

Mr. Zufelt is chairman of the AWWA Fluoridation Task Group which is charged with the compilation of data on the status of water fluoridation practice. As its first report, the task group presented a list of twenty-five questions and answers designed to provide comprehensive and objective discussion of the technique and philosophy involved in this practice. This report has already been utilized as the basis for the more elementary AWWA "Willing Water" question and answer brochure devoted to fluoridation. Mr. Zufelt summarized details of this committee report.

He then called on DR. H. T. DEAN, U. S. Public Health Service, Washington, D. C., to discuss the physiological aspects of fluoridation. Dr. Dean emphasized that the toxicity of the fluoride ion is determined by its concentration; fluorine is not now and never will be absent from the human diet (0.2 to 0.3 ppm. is always present); fluorine is not stored in the body, but is excreted largely in the urine; sound evidence justifies approval of water fluoridation practice.

DONALD B. WILLIAMS, In Charge of Purif., Public Utilities, Brantford, Ont., Canada, was called on to discuss his experimental study of calcium fluoride. This compound has been proposed as a source of fluoride ion. Mr. Williams reported no practicable method had been found to wet and dissolve calcium fluoride, that tests by a chemical manufacturer had confirmed this finding and that it could not be considered suitable for the purpose.

OTTO M. SMITH, Director of Research Foundation, Oklahoma A and M College, Stillwater, Okla., was called on to discuss the new material (trade name is Flural) which offers a combined coagulating and fluorinatin agent (contains up to 18 per cent F ion and 21.5 per cent Al_2O_3). For every 1.0 ppm. of fluoride ion added there will be 0.2 ppm. removed in coagulation. The new material, in very limited production, is expected to cost about 7c per pound.

The largest attendance of all purification division sessions was recorded at this panel discussion. When it was opened to questions from the floor, queries and comments from the audience proved literally endless. Lack of agreement on many aspects of fluoridation was evident in the pro and con attitudes expressed. Speakers included:

WARREN J. KRAMER, Chief, Water Supply, Div. of Health, said no public water supply in his state is fluoridated; there is considerable hesitancy in undertaking the practice.

CHARLES R. COX, Chief, Water Supply Section, New York State Dept. of Health, reviewed the first five years of results from the Newburgh experimental study. He reported practical and theoretical results in perfect accord. Careful medical and dental studies demonstrated detrimental effects to be non-existent. The State now favors the spread of fluoridation.

EDWIN A. SCHMITT, Head Engr. and Chief, Water Supply Div., Washington, D. C., cited data based on returns to a questionnaire indicating fluoride compounds to be in short supply.

MAURICE BRUNSTEIN, Supt. and Engr., Water Dept., Atlantic City, N. H., decried the growth of emperical fluoridation installations and favored more caution in general acceptance of the practice.

O. E. BROWNELL, Director, Div. of Water Supplies, Minnesota State Dept. of Health, questioned the suitability of commercial fluoride test kits for control of fluoridation. W. LESLIE HARRIS, Chief Chemist, Water Dept., Grand Rapids, Mich., cited good experience with the use of such kits.

NORMAN J. HOWARD, Director of Water Purif., Toronto, Ont., Canada, criticized basing of fluoridation cost data on total population when only children are benefited. O. J. MUEGGE, State Sanitary Engr., Wis. State Board of Health, pointed out that the caries reduction accomplished in children will ultimately affect our adult populations.

J. C. Zufelt
Supt.
Bd. Wat. Comm.
Sheboygan, Wis.

O. M. Smith
Dir. Research
Okla. A & M
Stillwater, Okla.

Fluoridation

O. J. Muegge
St. San. Engr.
Dept. Health
Madison, Wis.

W. J. Kramer
Ch., Wat. Sup. Div.
St. H'lth Dept.
Jefferson City, Mo.

C. R. Cox
Ch., Wat. Sup. Sec.
St. H'lth Dept.
Albany, N.Y.

N. J. Howard
Director
Water Purif.
Toronto, Ont.

Mutual Aid Test Drill

Westchester Co., N.Y. Zone

AT the end of World War II, New York State wisely provided for the permanent establishment of Mutual Aid among water works of the state. The effectiveness with which Mutual Aid had worked under the direction of Earl C. Devendorf Dir., Bur. of Envirn. Sanit., State Dept. of Health, Albany, had made its continuance appear logical.

With Mutual Aid legally established, it was a small task to reactivate it when Civil Defense again became of importance. Considering that New York State has several target areas in case of atomic bombing, it seemed wise to try out the effectiveness of the Mutual Aid plan. Two Zone test drills have now been made. The first at Niagara Falls, N.Y., a prime target area, and in Weschester County, a near-miss area to the prime target of New York City.

Zone Test

The test in Westchester County was held on June 27 and preceded the annual outing and meeting of the Westchester Water Works Conference, which was organized for mutual aid during the past war and which has been effectively continued as an organization since. For the test, a target area of 2½ miles diameter was picked so that valving off operations would be necessary around the southern part of White Plains, N.Y., the county seat, and the northern part of Scarsdale.

Participating in the test were 12 valve shut off crews from as many different water departments, some more than 30 miles distant. These water departments had been previously notified that when the signal came, they would be dispatched to certain control or dispatch points, outside the target area. Beyond that information they knew nothing of where they would go or what they would do.

Also participating were a number of Ham Radio operators, two in the control center and five in mobile units. At 9 a.m., the first call went out from the Ham Radio operators in the control center to other Ham Operators about the County. These calls were made to specific operators, who by messenger, informed the local water department as to where its crew was to be sent for further instructions. Fifteen minutes later, the same information was broadcast generally over the local F-M radio station; and fifteen minutes after that telephone calls were made direct to the water departments involved in the test. Four of the departments received their instructions through the first call, five more through the general radio call, and the other three by telephone. Within less than an hour from the first call, all crews had reached their assigned dispatch posts.

Valve Closing

At those points, (there were three, two in White Plains, one in Scarsdale) the valve crews were met by representatives of the respective water departments, and maps showing the location of valves to be shut off were given to each of the crews. Each crew had four or five valves to locate, uncover, place a key on the valve, chalk the underside of the valve box and replace the valve box cover.

When all valves had been located and marked, the crews returned to the points of assembly and reported to the mobile radio crews, who in turn reported to the control center. The effectiveness and speed with which the crews assembled, were dispatched, and accomplished their missions, was indicated by the fact that all crews had reported back within forty five minutes after reaching the dispatch point. Inasmuch as the valves were not actually closed in this test, the elapsed time is only an indication of the time necessary to issue the call, assemble and dispatch the valve closing crews. Total time for handling an emergency would include, of course, the actual time for closing the valves. This time can be estimated.

In the event of an actual bombing, valve closing would be only the first step in the procedure. Repair crews would follow, and damage repair would be tied in with the civil defense program, but valve closing as the first step to be carried out under mutual aid, appears to be the logical place to begin.

The success of this test could be laid to the cooperation of the several crews which responded to the test, to the Ham Radio operators to the work of the White Plains Water Dept., under John Friese, Supt.; to the Scarsdale Water Dept., under John F. Conlan, Supt., to the organizational set up work and maps of H. Warren Terry of Ossining; to W. T. Knott, Head, Amat. Radio Aid, Civ. Def., Westchester Co., and to James M. Harding, Commissioner of Public Works of Westchester County and Zone Coordinator of Mutual Aid for Westchester Co., as well as Asst. Dir. of Pub. Wks. in the Civil Defense Organization.

Among the vistors who observed the drill were Charles Vogt, State Dept. of Pub. Wks., Poughkeepsie; Stan. T. Barker, State Dept. of Health, Albany; R. C. Sweeney, State Dept. of Health, White Plains; H. R. Cohen, U.S. Pub. Health Serv.; Fred Welsh, Nassau County Dept. of Pub. Wks.; John R. Bailey, Fire Chiefs' Emergency Plan.; and F. B. Marsh and George E. Symons, representing the technical press.

Westchester Water Works Conference

In the afternoon, following the test, more than 165 members and guests of the Westchester Water Works Conference gathered at a picnic grove in the town of Greenburgh for a clam bake. During the afternoon, a tapping contest was run with three two-man contestant teams. The contest was won by the team from the town of Thornwood in the remarkable time of 5 minutes 31½ seconds. This team consisted of Ed Fischer and George Fries. Trophy for the contest is the Al Kassay Cup, donated by Al Kassay former Chairman of the Conference, and Supt. of Water of Tarrytown, N. Y. The town of Thornwood also won the cup last year and now has two legs on its permanent possession.

Riehl Becomes Sup't. of Purification Mahoning Valley District

Merrill L. Riehl has recently become Sup't. of Water Purification for the Mahoning Valley Sanitary District, Youngstown, Ohio, having resigned his position as chief chemist of the State Dep't. of Health Laboratories, Columbus, Ohio.

Mr. Riehl's prior experience in this field also includes three years with the Army Engineers 5th Service Command, four years with Charles P. Hoover, Columbus Division of Water, and two years as Instructor at Case Inst. of Technology, Cleveland, Ohio.

N. J. Sew. & Ind. Wastes Assn. Outing

The twelfth annual outing of the New Jersey Sewage and Industrial Wastes Assn. will be held at Doerr's Grove in Livingston, N.J., on Sept. 29, 1951.

Chlorine Dispersion With Fog Nozzles

Baltimore water plant demonstration shows Fire Department nozzles disperse, but do not absorb, chlorine gas in air

by EDW. S. HOPKINS, *Principal Assoc. Engr., Bureau of Water, Baltimore, Md.*
and HARRY A. FABER,* *Research Chemist, The Chlorine Institute, Inc., New York, N.Y.*

PREVENTION of chlorine leaks is of primary importance. Chlorinating equipment is in daily operation in thousands of water, sewage, and industrial waste treatment plants—yet reports of accidents involving chlorine are very rare indeed. A chlorine accident is almost always due to human failure rather than to failure of equipment.

If a chlorine leak does occur, however, it must be stopped as soon as possible. The plant personnel authorized to handle chlorine should be: Equipped with gas masks of type approved for chlorine service, trained in proper use of the masks, and drilled in emergency procedures for handling leaks[1].

Unless a chlorine leak is discovered quickly, the amount of escaped chlorine may be large and the difficulty of stopping the leak will be correspondingly increased. The danger of delay in stopping a chlorine leak is well illustrated by the events which followed the rupture of a chlorine cylinder at Ridgewood, N.J., as reported by Hood[2].

Present emergency methods for handling chlorine leaks include no suggestions for dispersing or absorbing chlorine gas from the atmosphere. If this could be accomplished, it would be possible to *reduce* the concentration of chlorine in the air and to *restrict* the area affected by the leak. Reduction of the concentration of chlorine in the air is important in order to enable personnel wearing canister type masks to safely investigate and correct the cause of the leak. Restriction of the area affected by the leak is important in order to prevent panic which may result if leaking chlorine reaches inhabited areas beyond the plant.

*Editorial Associate—"Water & Sewage Works."

Effect of Water Fog

The utility of standard fire department fog spray nozzles as a means of dispersing and absorbing chlorine from the air has been investigated. It is recognized that because of the low solubility of chlorine no method for the removal of chlorine from a dilute chlorine-air mixture can be very efficient. Nevertheless, fog spray nozzles produce water droplets of infinitesimal size, and the rapidity with which water will absorb chlorine increases with the surface area of the water particle.

With a water pressure of 60 pounds per square inch at the pumper and 130 pounds at the nozzle, each fog nozzle will deliver over 50 gallons of water per minute. *Under ideal conditions* 50 gallons of water (417 pounds) can dissolve about 3 pounds of chlorine. The practical solubility is considered to be approximately one-half of this value, since ideal conditions apply to saturated or equilibrium values.

Conditions simulating a chlorine leak were investigated on the grounds of Baltimore's Montebello Filter Plant. At the time of the demonstration the air temperature was 79°F. The wind was variable in direction and moved at a velocity of about 5 piles per hour.

Two fire hose lines were used, each equipped with a standard spray nozzle (see head illustration). Fire department personnel was from Company No. 33, an engine company which would normally reach the plant within two minutes after receiving the alarm. Hoses can be connected and spray nozzles can be in operation two minutes later.

In three separate tests, chlorine gas was discharged from a 150 lb. cylinder to the atmosphere. The cylinder valve was opened wide and chlorine was discharged for periods of 5, 10 and 15 seconds. As soon as the discharge was completed, firemen moved promptly into the area over which the gas had been discharged; they sprayed the visible cloud and followed the fumes in their direction of travel (see Figs. 2 and 3).

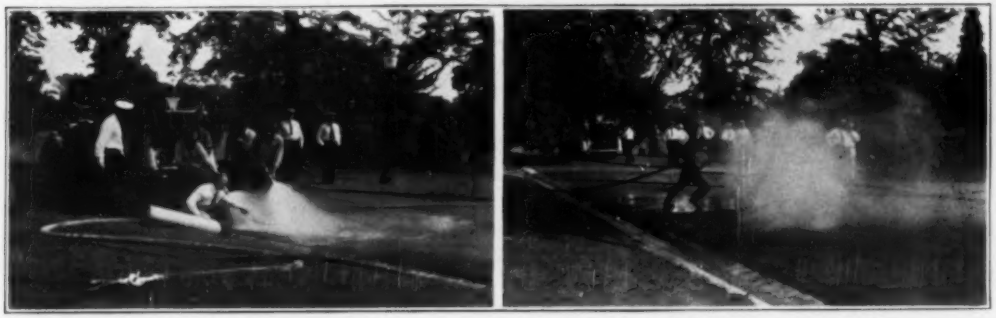
In the fourth test, liquid chlorine was discharged through a wide open valve on to the surface of a macadam road for a period of 12 seconds. Spray from fog nozzles was directed first upon the pools of liquid and then upon the gas cloud which had immediately formed (see Figs. 4 and 5).

Neither firemen nor observers wore gas masks in these tests, though canister masks were available. Observers moved ahead of the chlorine fumes, directing the work of the firemen and determining the maximum distance at which the odor of chlorine could be detected. Results of these tests are given in the following table.

Outdoor Chlorine Tests	Period of Chlorine Discharge	Distance Chlorine Traveled
Test 1 (Gas)	5 sec.	80 ft.
Test 2 (Gas)	10 sec.	125 ft.
Test 3 (Gas)	15 sec.	200 ft.
Test 4 (Liquid)	12 sec.	250 ft.

Fig. 1—BUILDING USED for indoor test.

Figs. 2 & 3—GASEOUS CHLORINE TESTS. Firemen demonstrate effect of fog nozzle spray against chlorine gas.



Figs. 4 & 5—LIQUID CHLORINE TEST. Directing fog nozzle spray against liquid chlorine on macadam road and chlorine gas in air.

The brick building used in the final test is 29 ft. long, 14 ft. wide and 18 ft. high. It has six windows and one door, all of which were closed but not sealed. In this test, the fireman handling the spray nozzles wore canister type gas masks. Chlorine gas was discharged into the building for a period of 15 seconds.

The door was opened, firemen advanced slowly into the building behind fog spray, and directed the nozzles in a rotary motion to cover the entire interior of the building. After 5 minutes of spraying, inspection showed a considerable concentration of chlorine was still present within the building (see Figs. 6 and 7).

Spraying was required for another 2 minutes before individuals not wearing masks could comfortably remain within the building. Windows were then opened and the building was entirely cleared of chlorine fumes by 5 minutes of additional spraying.

Conclusions

The demonstration to test the effectiveness of standard fire department fog nozzles in reducing and restricting the concentration of chlorine in air is considered to indicate:

1. *Dispersion* of chlorine can be accomplished by this method. The fog nozzles set up a turbulence which decreases the concentration of chlorine by dilution with air.

2. *Absorption* of chlorine cannot be effectively accomplished by this method. The application of fog spray to liquid chlorine will materially increase the rate at which liquid chlorine is converted to gas; some amount of gaseous chlorine must dissolve in the water droplets, but the indoor test indicated no substantial removal of chlorine.

Figs. 6 & 7—INDOOR CHLORINE TEST. Firemen inside building wear masks. Outside, observers test for chlorine with ammonia before entering.

3. This method is suitable for emergency use when limited to reducing and restricting the concentration of chlorine in air. When the chlorine concentration can be sufficiently reduced, it is possible to approach and repair a leak. When the concentration can be restricted, it is possible to confine a hazardous condition. Accordingly, the Baltimore Fire Department has authorized equipping all pumper engines, in areas where chlorine storage exists, with two fog nozzles instead of the single nozzle normally carried.

4. This method is not a substitute for permanent ventilation facilities designed to withdraw air and chlorine gas from a chlorine storage room at floor level.

The demonstration was arranged through the courtesy of Chief Michael Lotz of the Fire Department, and Water Engineer Leon Small of the Bureau of Water. Observers included Messrs. N. C. Weil, Solvay Process Div., Allied Chemical and Dye Corp.; C. M. Holt, Diamond Alkali Co.; George L. Hall, Chief Engr., Maryland State Dept. of Health; Harry R. Hall, Chief Engr., Washington Suburban San. Dist.

References

1. "Chlorine Manual." Published by The Chlorine Institute, Inc., New York, 1947.
2. Hood, J., "Chlorine Cylinder Rupture at Ridgewood Sewage Treatment Plant." Sewage Works Journal, *21*:720 (1949).

WORLD'S LARGEST TURBINE PUMPS

At New York's Hudson River Plant

When the famous 1949 drought hit New York City, the city's Board of Water Supply sought for new sources to meet current as well as growing future needs. The Hudson River, 60 miles north of the city at Chelsea, N.Y., was considered as a source to tap the waters of the Hudson River. Plans were to take 100 mgd., mix this with seven times that volume of upland watershed water, and with additional chlorination, provide an emergency supply. Contract for a plant to supply 100 mgd. was awarded in the spring of 1950 to Tuller Construction Co. and A. S. Dillenbeck for $2,684,000. The plant has now been completed and is ready for service in case the present decrease in New York's water supply storage is reversed.

A big mechanical problem in this new pumping plant was the supply of pumps which could provide 100 mgd. against a 575 foot lift. Wide latitude appeared in the specifications for pumps although the centrifugal type was called for, either with vertical or horizontal shaft. The rated head was 575 feet but operation was called for at any head between 525 and 625 feet. Each pump required a capacity equal to 100 mgd. divided by one less than the number of pumps installed, or a rated capacity of 14,000 gpm. each. The pumps were supplied by Peerless Pump Co., a division of Food Machinery and Chem. Corp. These pumps are vertical close-coupled turbine type pumps, the largest of the type ever to be manufactured. Of these six units, five would carry the full load, as each one has a capacity of 20 mgd. at a head of 600 feet, allowing one for standby service. These pumps have five 36 in. diameter bowls with discharge of 24 in. diameter. The synchronous type electric motors, direct connected to the pump, each are rated at 2500 hp. and operate at 900 rpm. on three-phase, 60 cycle current at 4,000 volts. These motors were manufactured by General Electric Co.

A system of automatic controls provided a fixed sequence of valve operations when starting the pumps, either normally or in an emergency during power failure. Controlled by electric interlocks a number of conditions must be fiulfilled before motors are brought to full speed and synchronized and valves open. The same operation takes place, in reverse, when the stop button is pressed.

Sewage & Industrial Wastes Federation Program

Just as we go to press the program for the 24th Annual Meeting of the Federation of Sewage and Industrial Wastes Associations, to be held in St. Paul, Minn., has reached us. We are rushing it into print and displacing another item in order to get it to our readers well ahead of the meeting dates, Oct. 8-11. The St. Paul hotels are the Lowry, the St. Paul, the St. Francis, all within three blocks of the Convention Hall. If the hotel of your choice can not accommodate, your request for reservations will be referred to one of the other two.

SUNDAY, OCTOBER 7

Afternoon

Early registration and inspection of exhibits

MONDAY, OCTOBER 8

Morning

Welcome to St. Paul
Mayor Edward K. Delaney

National Water Resources Policy
L. R. Howson

Materials Procurement—Today's Problems
Harvey S. Howe

Afternoon

Psychoda Fly Control at Akron
T. C. Schaetzle

Raw Sludge Concentration—Pilot Plant Studies
John F. Laboon

High-Rate Chemical and Biological Treatment of Sewage
Theodore Jaffe

Fundamental Approach to the Activated Sludge Process
Ross E. McKinney

Evening

Family Night Entertainment

TUESDAY, OCTOBER 9

Morning

Plating Wastes Problem—Electroplater's Viewpoint
A. Kenneth Graham

Treatment of Phenol Wastes with Chlorine
A. E. Griffin and N. S. Chamberlin

Disposal of Ammonia Still Wastes
W. W. Mathews

Volume Reduction of Chromic Acid Wastes
Frank R. Keller

Noon

Federation Luncheon (Hotel Lowry)
Address: "Industry's Investment in Pollution Control."
L. A. Danse

Afternoon

Fifty Years of Pollution Abatement in New Jersey
Robert S. Shaw

Principles of Classification of Streams for Best Usage
Anselmo F. Dappert

Relationship Between Air Pollution and Water Pollution
Louis C. McCabe

Problems of the Greater Winnipeg Sanitary District
N. S. Bubbis

Evening

Central States Smorgasbord and Business Meeting

WEDNESDAY, OCTOBER 10

Morning

Sewer System Record-Keeping
K. B. Stallings

Instrumentation in Sewage Treatment
W. N. Greer

Determination of Equitable Sewer Charges for Industrial Wastes
George J. Schroepfer

Moving Picture—"A Tale of Twin Cities."
Minneapolis-St. Paul Sanitary District

Afternoon

Inspection Trip
Minneapolis-St. Paul Sanitary District
South St. Paul Sewage Treatment Plant

Evening

Annual Dinner and Dance (Hotel St. Paul)

THURSDAY, OCTOBER 11

Morning—Concurrent Sessions

Industrial Wastes Forum
CLAIR N. SAWYER, Leader

- **Control of Process Losses**
- **Operation of Anaerobic Treatment Units**
- **Operation of Aerobic Treatment Units**
- **Operation of Evaporation Facilities**

Sewage Works Operation Forum
GEORGE E. SYMONS, Leader

- **Chlorine Conservation by Efficient Operation**
- **Meter Maintenance and Repair**
- **Improving Grit Removal and Sludge Dewatering**
- **Combined Sewer Operation**

Noon

Adjournment

ASSOCIATION LEADERS—Seated: Sam Weed, Prof. H. B. Gotaas (New Pres.), Fred Nelson (Ret. Pres.), Arthur Pickett (1st V.P.), L. W. Cook (2nd V.P.). Standing: H. W. Jorgensen (Prog. Ch.), Ben Benas, K. A. Keirn, Ray Ribal, E. G. Studley, Eric Quarterly, A. Segel.

California Sewage Works Assn. Twenty-Third Convention

A Report

by HOMER W. JORGENSEN, *Cons. Engr., Modesto, Calif.*

HAILED as one of the most successful in history, and boasting the largest attendance in years, the twenty-third Annual Convention of the California Sewage Works Association was held April 25th to 28th, in Fresno, Calif. Total registration was 280 members, wives and guests, surpassing by a slight margin last year's attendance at Long Beach.

The Thursday luncheon, with Vice-president Prof. H. B. Gotaas of the University of California presiding, included welcomes by Mayor Dunn and Sewer Commissioner Jones of Fresno. National Director Ken A. Keirn, Wallace & Tiernan Western Div. Mgr. presented the Arthur G. Bedell award to Edward A. Reinke, Chief, State Bureau of Sanitary Engineering, one of the charter members of the C. S. W. A. who served for several years as its secretary and later as president.

New Officers

At the Friday luncheon the following were elected as officers for the ensuing year:

President: Prof. H. B. Gotaas, Head, Civil Engr. Dept., U. of C.

First Vice-President: Arthur G. Pickett, Industrial Waste Engr., County of Los Angeles.

Second Vice-President: Lawrence H. Cook, Consulting Engineer, Menlo Park.

Secretary-Treasurer: Sam Weed, Asst. Drainage Engr., City of Oakland.

Director (1951-1956): A. Segel, City Engineer, City of Fresno.

Saturday's Caravan

Although a slight precipitation rendered the dirt roads of the Fresno Sewer Farm so muddy as to be all but impassable, the Saturday morning caravan was well attended by those wishing to see the Treatment Plant providing the primary treatment prior to disposal by irrigation. It was learned that last year the surplus of revenue from the Fresno's Disposal Farm, over cost of operation of plant and farm, was $20,000.

A visit was also made to the Fresno Waste Disposal area where refuse is handled by the cut and cover method in an economical and sanitary manner that has received wide acclaim.

Radioactive Waste

"RADIOACTIVE WASTE DISPOSAL," a paper by John F. Newell and C. W. Christenson, Industrial Waste Branch, U.S. Atomic Energy Commission, Los Alomas, N. Mex., was read by N. W. Anderson, San. Engr., Los Angeles County Sanitation Districts.

All radioactive substances are continuously disintegrating through the emission of alpha or beta articles resulting in a stable element. The rate is expressed in terms of "half-life" which is the time required for one-half of the atoms of the material to disintegrate. Rates vary from less than a second to billions of years.

Detection is by "counting" to measure the concentration by noting the counts per unit of time per unit volume. The basic unit or curie is defined as the radiation of one gram of radium or 37 billion disintegration counts per second.

Normally, radioactivity has no effect on aquatic plants or animals, conversely they may concentrate it to a higher state than their liquid environment.

Tentative tolerance values subject to later revision have been established. For example, water could be drunk without risk for 10 days after a disaster if the beta and gamma counts were less than 90 microcuries per liter or alpha less than 5.

Where possible radioactivity materials are removed from the liquid to be concentrated in the smallest possible package for storage. Other treatments include evaporation, ion exchange, adsorption, chemical coagulation, and biological oxidation.

One plant, operating with a design of 125,000 gal. per month to treat to "no detectable radioactivity," with solids stored in steel drums, cost 13.8c per gal. to operate.

By using ion exchange a laboratory waste of 1,000 gal. per week having 2,000 ppm. solids can be treated in a two-bed ion exchange system with a

final waste volume of 0.6 cu. ft. for a cost of $50.00 per week.

Chemical precipitation, particularly as a phosphate seems to show considerable possibilities for some materials. Activated sludge seems adaptable to plutonium, which is adsorbed easily, although operating problems arise. Adsorption by pumice, celite, tuffa, etc. has shown promise.

At Los Alamos, a plant has been built using coagulation with iron and lime, settling, sand filtration, and vacuum filtration of the sludge, to produce drinking water. For a laundry waste high rate filtration with a 6 : 1 recirculation and very low loading of 0.3 mgad. and 150 lb. B.O.D. per ac. ft. produced satisfactory results.

Civilian Defense

"Symposium on Effects of Defense Activities" by Omar C. Hopkins, moderator, Sr. San. Engr., USPHS, San Francisco.

The USPHS, the State Health Dept. and the Sixth Army officials in this state are cooperating to provide adequate defense.

A conference of State Sanitary Engineers of the West brought the conclusions that there need not be a shortage of technical leadership if training programs are held immediately. Civilian Defense requires a full time staff with adequate budget, and the biggest problem is for the public to comprehend the implications of an atomic blast.

Civilian Defense groups have to develop a program which can be superimposed on the normal functions of a community without disruption, and maintain its potential power until the international situation permits relaxation of effort.

San Joaquin Valley Problems

"Industrial Waste Problems of the San Joaquin Valley" was the title of the luncheon talk by Gen. James K. Herbert, Pres., Roma Wine Co., Fresno, Calif.

Gen. Herbert pointed out that in the Central Valley two important factors are forcing the problem of waste treatment. Fresno population increased almost 50 per cent in the last 10 years and the same is true of other valley areas. In addition, the minimum flows in our rivers occur at the peak flow of industrial waste from our plants processing agricultural products.

A few years ago Fresno voted a bond issue to expand its sewerage facilities and just last year an ordinance satisfactory to both the City and industry was passed giving some definite stands for future planning of industrial operations.

The many wineries on the outskirts of Fresno until recently were surrounded by farm lands but are now finding themselves with sub-divisions nearby. Pressure has been applied to demand control of odors. Through research of the California Wine Institute and others the following plan has been found satisfactory; seven shallow ponds are used in rotation each receiving waste for one day to be followed by six days rest.

At the Roma Winery during the season load on the sewers is minimized by recovering tartrates, correcting pH, etc. In the off-season, grain is distilled with 100 per cent recovery of the waste, in fact considerable revenue is returned through its sale as cattle feed.

Los Angeles County Refuse

"The L. A. County Sanitation Districts Refuse Study: Garbage Grinding Aspects, by A. M. Rawn, Chief Engr. and Gen. Mgr., and F. R. Bowerman, San. Engr.; Los Angeles County Sanit. Districts.

The 1949 State Legislative Session amended the County Sanitation District Act to permit entry into the field of refuse collection and disposal. The districts then undertook a study of the factors involved and after a year was able to report many findings and conclusions. The area in question involves 470 square miles, all or parts of 33 cities and many unincorporated communities with a total population of 1,800,000 of which 500,000 are not served by garbage disposal districts or cities.

BEDELL AWARD to E. A. Reinke being delivered by Federation Director K. A. Keirn, right.

Collection systems are the more costly phase but can be designed to meet local conditions. Final disposal of refuse where continued growth removes more and more appropriate areas for final disposal, makes this phase of the problem difficult. It is estimated that existing disposal sites will last 25 years for mixed refuse but burning will extend the life to 50 years.

In Northern California, collection is usually once a week whereas in Los Angeles it is almost universally semi-weekly, the reasons apparently not being the climate so much as the fact that here disposal is to hogs. If hog feeding is abandoned here less frequent collection might be permitted.

Three-fourths of the combustibles are burned in backyards. This savings however contributes to the "smog," and will undoubtedly soon have to be abandoned.

It is proposed to collect combustibles as well as non-combustibles in the areas having a population density of over 6 per acre once a week. Garbage and combustibles from commercial area must be collected each day to avoid storage problems.

Hog ranches can no longer operate without creating nuisance because of decreasing isolation within the limits of economic transportation. Hence, it is proposed that this practice be abandoned in favor of central grinding stations for the collected garbage to be located on the District's trunk sewers.

GLOBE TROTTERS talk on European Practice. Prof. Jack McKee, Calif. Inst. Tech., C. C. Kennedy, Cons. Engr., Prof. H. B. Gotaas, Univ. of Calif., Arthur Pickett, Los Angeles County San. Engr. (Moderator).

A total cost for grinding and handling at the plant is $1.22 per ton less any credit for revenues from by-products. At present 10 per cent of the houses have home grinders contributing. No important problems are anticipated by use of such units unless sewers are of sub-standard design.

Composting shows future promise but further studies must be made before use on such a large scale operation. Initially, combustible refuse is to be buried but after further studies on incineration, large scale high temperature incinerators will be used. The cost to burn refuse and dispose

BREAKFASTEERS—H. W. Jorgensen and Wayland Jones, Moderators.

of the ash will approximate $2 per ton.

Salvage from refuse is to be in the hands of private salvagers but operated under control of the districts. Costs under the proposed plan would exceed existing costs because more sanitary and expensive collection vehicles and more dependable personnel would be used, service would be for less densely populated areas and unsatisfactory disposal methods would not be used. It is felt that the higher cost is justified by an obvious improvement in the sanitary environment of the district.

Capital costs average only 4c per $100 of assessed valuation while operation and maintenance will be 45c per house for service to the curb or 62c for backyard service. For the average house with an assessed valuation of $2200 the 49c rate amounts to $11 per year or 90c per month.

Ground Garbage in Sewage

"The Effects of Ground Garbage on Sewage Characteristics," by Russell Ludwig, Ludwig Bros., Cons. Engrs., Pasadena.

For the Los Angeles Co. Sanitation Districts an accurate appraisal of the garbage-to-sewer phase was required. For the study, the Imperial Crest Housing Project, near Long Beach, comprising 1220 homes on 204 acres with a population of 4,000, where each home has a garbage grinder was compared to a similar area without ground garbage. In a residential area, a sewage flow was 50 gcd. whereas in the whole district's area, which includes industrial waste, 85 gcd. is the average, hence the effect of ground garbage in the latter is much less.

In this tract it is of interest to note that 40 percent of the houses are equipped with automatic washing machines and 50 percent with home water softening units. Sampling was done over a 24 hour period for a total of three weeks while flow was gauged with a V-notch weir; weighted grab samples were collected every 30 minutes. The typical morning peak was found to be 20 percent greater on Monday due to laundering.

Comparative characteristics of garbage-sewage and ordinary sewage are shown in the following table.

	Sewage & Garbage	Sewage only	Increase
Susp. Sol.—ppm.	380		
lb./cap.	0.154	0.107	0.047
Grease—ppm.	115		
lb./cap.	0.047	0.019	0.028
B.O.D.—ppm.	390		
lb./cap.	0.158	0.104	0.054

An inspection of the eight to fifteen inch diameter sewers was made. Some of the smallest are laid on a slope of .24 percent (velocity of 1½ F.P.S.) A number of mortar fins at the joints permitted lodging of material during low flow. This resulted in occasional sulfide content. Both the flat grade and the poor construction in this tract are significant but not serious. Adding of garbage resulted in (1) deposits of eggshells, etc. at minor obstructions and (2) accumulation of grease at or above the flow line. It would seem that this accumulation is greatly increased by the garbage slurry.

Clay Products Institute

"The Pacific Coast Clay Products Institute; Its Aims and Activities," by John Fredericks, Pres. Pacific Clay Products Co. and Pres. Pacific Coast Clay Products Inst. The paper was read by A. J. Wintersgill, Vice Pres. of the Institute.

The C.P.I. is a non-profit organization formed twenty years ago for the clap pipe industry to foster improvements in the product as well as compile data in a handbook for use of engineers, etc. In California many new ideas have been developed, including standardizing the sizes among manufacturers in the area and promoting the use of unglazed pipe which has the advantage of permitting application of greater heat and has a greater crushing strength.

The objectives of the C.P.I. include development of high standards of performance and giving assistance to engineers of member companies in establishing adequate specifications to insure permanent structures. The C.P.I. has recently published a third edition of a handbook on sewer construction. Separate editions are supplied for Northern and Southern California due to the difference in specifications.

Concrete Pipe Assn.

"The Western Concrete Pipe Assn.—Its Aims and Activities," by Harold W. Chutter, Pres., Jourdan Concrete Pipe Co. and Pres., Western Con. Pipe Assn.

The W.C.P.A. is an outgrowth of the old California Association of Concrete Pipe Manufacturers which originated in Fresno 32 years ago. Its members now include seven manufacturers having 100 plants in Western United States and Alaska. All types of pipe, irrigation sewer pressure made by all types of processes, tamping, packer head, centrifugal, vacuum, and pre-stresses are made by its members. Sizes produced range from the smallest irrigation drain to 15 feet in diameter which was recently made for the U.S. Bureau of Reclamation. Incidentally, the large sizes have been found ideal for bomb shelters and can be built with concrete floor and roof, etc.

The aim of the association is to foster the use of concrete pipe wherever suitable. This is a non-profit organization similar to the C.P.I. in objective. A new handbook entitled "Concrete Pipe" by the American Concrete Pipe Association is just off the press and is now available.

European Practice

"Panel on Observations of Sewerage Practice in Europe by H. B. Gotaas, Head, Dept. Civ. Engr., Univ. of Calif., Berkley; Jack McKee, Prof. San Engr., Calif. Inst of Technology, Pasadena; and Clyde C. Kennedy, Cons. Engr., San Francisco.

Prof. Gotaas pointed out that in Europe more attention is paid to utilization of by-products of sewage treatment than in this country. In particular, England is highly industrialized and has many small streams which are sources of water supply, hence treatment is very important.

Prof. Gotaas spoke about Birmingham, Paris, Middlesex County, high rate filters, prestressed tanks, sludge fertilizer value, etc.

Prof. McKee reported on his eight week visit to Germany and his observations of the effect of two wars, the effects of U.S. money and military Govt. in restoring damaged plants, the practice of raw sewage irrigation and the use of bottled sewage gas in automobiles.

MR. KENNEDY spoke about the depletion of soil fertility in Egypt, the eastern end of the Mediterranean area and Italy; also of plants in Switzerland, Baden-Baden, Essen and the Ruhr where he met Dr. Karl Imhoff. Mr. Kennedy also visited Holland, Paris and England.

American Practice

"OBSERVATIONS ON SEWER MAINTENANCE IN AMERICAN CITIES" by Sydney Preen, Supt. of Sewer Maintenance, Long Beach, Calif.

In Dallas, for instance, lime has been used in force mains for control of sulfides and found very satisfactory. At Miami Beach, where the sewer scooter was invented, there is an unusually complete program for sewer cleaning, utilizing the most modern equipment. They believe that using the latest proved procedures provides the most economy.

One general observation was that there was little coordination of activities between cities or exchange of ideas. In many cases rather than cooperation between neighbors there seemed to be an attitude of indifference. In Southern California there is closer relationships, which is a mutual advantage.

More emphasis on sewer maintenance is needed and sewage works association should give more recognition to those in this field. It seems that at present most of the interest is in sewage treatment plant operation. There should be means for more exchange of ideas among maintenance men for preventive maintenance where a dollar can do the work of two or three that has to be spent later on when the sewer or structure has to be replaced.

Mr. Preen's paper was discussed by JAMES L. CAREY, Asst. Supt. Sewer Maint., Los Angeles; Richard Pomeroy, Cons. Chem., Pasadena; and Arthur Pickett, County Ind. Waste Engr., Los Angeles.

Full agreement was given to the thought of more emphasis on sewer maintenance in the activities of the association. An increasing problem in sewers seems to be fouling up from grease. Many cases have been observed where improper design and operation of grease traps has resulted in a worse situation than without a trap. The increasing use of commercial detergents and soapless washing powders for domestic use is showing an effect on both sewers and treatment works. If the sewers are designed properly and given a good cleaning of past accumulations the build-up of grease, etc. due to the increasing use of garbage grinders is offset to a great degree by the use of detergents.

Hyperion Plant

"THE HYPERION ACTIVATED SLUDGE PLANT; THE FIRST YEAR," by G. A. Parkes, Plant Supt., City of Los Angeles.

The Hyperion Plant has operated for about a year as a primary treatment process and a little over a month as a high rate activated sludge plant. With a design capacity for full treatment of 260 mgd. and hydraulic capacity for over 350 mgd. during storms, it can be appreciated that a plant of this size takes a long while to get into high gear. The usual troubles of setting up an operating routine, laboratory control, etc. have been experienced. In addition there were the "bugs," most of which could not have been foreseen during design. The general status at present is that the primary features and sludge digestion are in reasonably good shape and at present the tricky problems inherent in this type of secondary treatment are being worked out.

As yet, operation is not far enough into the phase concerning handling of digested sludge to know what the shortcomings, if any, will be. The process will include adding of chemicals, filtering, drying, storage, for removal by trucks, or if desired incineration of sludge.

One item that gave trouble was the inadequate clearance provided between the redwood sludge scrapers flights and the bottom of the tank. The flights expanded and warped when the tank was filled and caused binding in several places. By changing the clearance from ¼ in. to a good inch or inch and a half the problem was selved. Incidentally, it was learned the hard way *not* to attempt to reverse the chain drive in working on flights, connectors, etc. Much better to shut down that tank and pump it down as soon as convenient.

Detergents have caused a king-sized bubble bath in the aeration tanks. Although the process isn't affected much it is a serious nuisance. Some of the walk-ways have become dangerously slippery although to date there have been no accidents. Also, the bubbles dry in the sun producing bad odors. A water spray is being considered but both the cost and the shortage of piping is holding it up.

It has been learned that this high rate is totally different from the standard activated sludge process. For instance 200 ppm. instead of 1500 or 2000 ppm. of solids are carried. The process is more easily upset but fortunately it is easier to empty a bad tank and start all over.

The primary plant with its preaeration removes 65 to 70 percent of B.O.D. and suspendid solids. After one month of operation, preliminary conclusions are that complete treatment is removing 85 to 87 per cent. Of great importance is the fact that chlorine demand has been reduced from 15-20 ppm. to about 5 ppm. resulting in large savings of chlorine used in the effluent.

The nine 1680 horsepower Worthington dual fuel engines in the power plant are proving very successful. A much higher efficiency is obtained over standard compression gas engines. It will work on low quality gas, although the 4,000,000 cu.ft. per day is rather good and has a Btu. of 615.

Vapor phase cooling is proving out well. The engines operate at about 250°F. with no sludge condensation or apparent wear after a year of operation. Steam from high temperature cooling along with the exhaust heat is used for sludge heating by direct injection using a flash mixer. The

LOCAL ARRANGERS—Fresno's Deputy Comm. of Works, A. Segal (center), Mrs. Segal and Edw. S. Cary, Ass't State San. Engr., Fresno Distr.

procedure is recommended highly. The water increase is negligible and the only trouble is that all the water must be softened.

The paper was discussed by R. R. KENNEDY, Cons. Engr., San Francisco, who commented on the favorable results of pre-aeration at the Hyperion plant and at Stockton, Calif.

Operators' and Engineers' Breakfasts

Moderators for the discussions held during the Operators' Breakfast were WAYLAND JONES, Supt. Sew. Disp., Stockton and HOMER W. JORGENSEN, Cons. Engr., Modesto.

Among the many topics discussed were: Operator certification, increase pay for operators, digester operation with cannery wastes, odor control, man-power shortage, regional meetings, education, sewer cleaning, and industrial waste problems. The session was summarized by HOMER PARKER, Ch. Oper., Riverside.

Moderators for the Engineers' Breakfast were PAUL WARD, San. Engr., State Health Dept., Berkeley; and JACK PRATT, Process Engrs. Co., San Francisco. This session was summarized by HARVEY M. COLE, San. Engr., San Diego, who reviewed the comments on: Public relations, available funds, bio-filter units, effluents from sub-division plants, specifications, material shortages, and electrical safety classifications.

Open Forum

An Open Forum on Design and Operation of Sewage Works was moderated by Association President FRED NELSON, The Dorr Co., Los Angeles.

In addition to the summaries of the two separate breakfast discussions, other topics discussed included: Cross connections, sewer maintenance, resurfacing streets, hand rails at plants, inspection of sewers, landscaping and public relations.

Water Pollution Control Symposium

"AT THE STATE LEVEL" by Vinton A. Bacon, Exec. Off. State Water Poll. Cont. Bd., Sacramento.

After a year of operation the State and Regional Water Pollution Control Boards set up by the last Legislature are accomplishing their intended purpose, and with a few minor amendments this year should become even more effective.

The State Board has confined its effort largely to broad policies, research, and relationships with other agencies at the State or federal level. Current legislation for example is receiving very careful attention.

The basic definitions of contamination, pollution, and nuisance have held up well in segregating responsibility of the State Health Dept., who have the first one, and the new Boards, who have the others. Likewise has the philosophy of prescribing requirements only, for a given area or stream, leaving the manner of effecting the results to the applicant and its consulting sanitary engineer.

Regional Level

"AT THE REGIONAL LEVEL" by Col. Jos. S. Gorlinski, Exec. Off., Cent. Val. Reg. Wat. Poll. Cont. Bd.

An example of the regional approach to the problem is found in the case of Modesto, where the State Health Dept. studied the river so requirements could be set up. Then meetings were held for protest of the proposed standards and to acquaint the users of the river as to their responsibilities. The stipulation has been made that a review will be made next year to profit by experience and allow a possible slight modification. One of the key considerations in the procedure is determining the "beneficial uses" for various reaches of any river, which involves obtaining data from every possible source as to the various uses to which each reach may be put.

The relationship with the local health department is important. They can act more quickly in an emergency and frequently know the local situation better. It is also better public relations to have as much local control as possible.

Sewage Irrigation

"SEWAGE DISPOSAL IN THE SAN JOAQUIN VALLEY" by H. B. Foster, Jr., Supr. San. Engr. and E. S. Cary, Assoc. San. Engr., State Health Dept.

Disposal in the Valley is governed by the State regulations made in 1933 with appropriate revisions since, for disposal of effluent. The economics of sewage irrigation are well proved both by the fact farmers ask for it and profits are shown by cities like Fresno and Visalia. Last year Fresno showed a profit of $20,000 after costs of plant and farm operation were paid.

Alkali and sandy soil are improved as for example at Fowler where unproductive land is now yielding four bales of cotton per acre. At Delano each year more acreage is put into profitable crops. Industrial wastes are also handled this way. At Kingsburg and Tulare, treatment is separate. At Tulare the milk waste goes directly to two oxidation ponds for 30 days detention and the effluent is combined with the domestic effluent for irrigation. At Kingsburg industrial waste is handled in percolation ponds in cycles in a satisfactory manner. At both Fresno and Visalia the wastes are combined and at present the plants are over-loaded in the peak season.

This paper discussed construction costs for several plants and a member of individual plants in the San Joaquin Valley. In general, the increasing construction cost index seems to have been offset considerably by increasing competition among contractors in the Valley. A case in point is the comparison between Clovis and Fowler; for about the same design the prices were almost identical but were bid three years apart.

FIRST SESSION PARTICIPANTS—Ed Thoits, O. C. Hopkins, Arvie Dahl, Russell Ludwig, N. W. Anderson, H. W. Chutter.

Fringe Area Problems

"THE FRINGE AREA WASTE DISPOSAL PROBLEM" by H. W. Jorgensen, Cons. Engr., Modesto, Calif.

Two of the many cities having fringe area problems are Modesto and Fresno, California.

Modesto's population is about 20,000, with another 30,000 in the surrounding area, of which one third is in a sanitation district, leaving 20,000 as a group who have not yet taken steps toward obtaining sewers. It is this group which is the subject of the speaker's study. One of their alternatives is to annex to the City and another is to participate in an overall district including the City. The former idea is developing some opposition in the fringe area, whereas the City prefers a policy of holding out sewage treatment service as a benefit only on annexation, hence does not favor the latter. Others feel that annexation will result just as fast this way since the psychological barrier of the sewer problem will now be removed and other factors will govern, adding that an overall district will be simpler and more equitable in its operation.

Since the group in question would find a more economical solution by participation some way with the City, rather than independently, it is necessarily interested in the plan to be used by the City, which is faced with the need for expansion to meet state requirements, even with its existing load. Two possibilities are presented, a new site or adding to the present site.

It has been estimated that about $1,250,000 would be required to bring the present site up to state standards for the present population of the metropolitan area. Preliminary estimates are that the same amount required for complete treatment at the present site as above would provide the primary treatment at a remote site with irrigation use of the effluent, for not only the present but allowing for considerable future growth. Full advantage would be taken of many existing units. Rather than add any more units to the existing plant, the present vacuator, clarifier and high-rate filter would be used for the domestic waste and the industrial waste would receive its treatment at the remote site where consequences of plant upsets would not be so serious.

At Fresno one portion of the fringe area is involved in a unique plan. To provide sites attractive to industry the Chamber of Commerce obtained control of a 500-acre site, of which it purchased over half. Utilities, including sewers are being provided, and sites will soon be ready to sell. Although the engineering was not difficult the financing involved two major industries and the County, who agreed to aid the project with the expectation of future reimbursement.

Recommendations were for disposal into the City system at present, but with a thought to the future when this and adjacent areas might wish to incorporate as a district for independent treatment and disposal.

FORUM PARTICIPANTS—John Snyder, Richard Pomeroy, Ray Ribal, Randolph Fenchel, Harvey Cole, Fred Nelson, Carl Patchen, Harold Davey, Homer Parker.

K. S. Watson, GE's Industrial Waste Coordinator

Kenneth S. Watson, formerly assistant director of the Ohio River Valley Water Sanitation Commission, has been appointed coordinator of industrial waste treatment for the General Electric Company.

This was announced recently in Schenectady by Robert Paxton, G-E vice president in charge of manufacturing policy, on whose staff he will serve.

A native of Greensboro, Penna., Mr. Watson attended West Virginia University, where he received his bachelor's degree in 1934 and a master's degree in chemical engineering in 1936.

He was executive secretary-engineer of the West Virginia Water Commission before he entered the interstate pollution field. In this post he directed a statewide program of stream zoning and industrial and domestic water treatment. He was a member of the Interstate Commission on the Potomac River Basin, and chairman of its Technical Committee.

During World War II, Mr. Watson served as a major in the U.S. Army Corps of Engineers. In the European Theater of Operation, he commanded an engineer combat battalion. Later he was Trade and Industry Officer for the City of Frankfurt, Germany.

He is a member of the American Institute of Chemical Engineers, the American Chemical Society, the Federation of Sewage Works Associations and the American Water Works Association.

A Neutralization Nomograph

For Determining Alkali Requirement in Neutralizing Acidic Wastes

by RICHARD D. HOAK, *Senior Fellow, Mellon Institute,*
Pittsburgh, Pa.

THE nomograph presented herewith was prepared specifically to provide a rapid method for determining the weight of lime required for complete neutralization of a given volume of waste pickle liquor. This liquor is primarily an aqueous solution of ferrous sulfate and sulfuric acid. The nomograph can readily be applied, however, to many waste acid neutralization problems.

Calcium hydroxide (slaked or hydrated lime) is only slightly soluble in water, but that which dissolves is completely ionized to calcium and hydroxyl ions. When lime slurry is mixed with pickle liquor the hydroxyl ions combine rapidly with the hydrogen and iron ions, permitting more lime to dissolve. For every hydroxyl ion that reacts, an equivalent amount of calcium sulfate is formed; this compound largely precipitates, due to its limited solubility. Complete treatment of pickle liquor by neutralization with lime may therefore be considered as a union of calcium and sulfate ions. To compute the amount of alkaline agent required to neutralize a given quantity of acid liquor, it is thus necessary to know only the total sulfate content of the liquor and the available calcium oxide equivalent of the alkaline agent.

Determining the Acid Value

The acid value of pickle liquor, as grams of sulfate ion per liter, can be determined by the following method in about 20 minutes with an accuracy of 0.2 per cent.

Procedure. Pipette 5 ml. of the acid liquor into 50 ml. of distilled water in a 250 ml. beaker. Run in from a burette 25-30 ml. of 0.5 N sodium hydroxide in excess of that required for complete reaction. Heat to boiling for 2-3 minutes, stirring to avoid loss by bumping. This operation converts the precipitate to a black iron oxide which settles rapidly. Wash the mixture into a 250 ml. volumetric flask, cool to 20°C., make up to the mark with distilled water, mix, and allow the precipitate to settle. Pipette, or decant, a 100 ml. portion into a beaker, add several drops of phenolphthalein indicator solution, and titrate with 0.5 N sulfuric acid to the disappearance of the pink color. The sulfate is calculated from the formula

$$\frac{48\ (\text{ml. NaOH} \times \text{N} - (\text{ml. } H_2SO_4 \times \text{N})}{\text{aliquot fraction} \times \text{ml. sample}} = \text{g. } SO_4\text{/liter}$$

Where both acid and alkali are exactly half normal, a 5 ml. sample is used, and a 100 ml. aliquot is taken, the formula simplifies to

$$12\ (\text{ml. NaOH} - \text{ml. } H_2SO_4 = \text{g. } SO_4\text{/liter}$$

Determining Basicity of Lime

Where an acid liquor is to be neutralized with lime, it is the available alkalinity that is important, whether present as calcium oxide or some other constituent of the lime. The complete chemical analysis of lime is time-consuming, and, for various reasons, such an analysis may not yield the actual neutralizing value of the substance. It is preferable to determine the available basicity of lime as follows.

Procedure. Using a weighing bottle, weigh accurately about 1.3 grams of lime and transfer the sample to a small porcelain crucible. Place the crucible upright in a 250 ml. beaker containing 15 ml. of water. Cover the beaker, heat the water to boiling, and tip the crucible to fill it with the hot water. Allow to stand for several minutes to slake the lime completely. Scrub the crucible inside and out with a rubber policeman, wash and remove it, run in from a burette the quantity of 0.5 N. sulfuric acid required to react with the lime, then add 30-35 ml. in excess. Wash the mixture into an Erlenmeyer flask, boil, make up evaporation loss with water, cool to room temperature, add a few drops of phenolphthalein indicator solution, and titrate with 0.5 N sodium hydroxide to the first appearance of a pink color. The basicity factor, as grams of CaO per gram of sample, is calculated as follows:

$$\frac{0.028\ (\text{ml. } H_2SO_4 \times \text{N}) - (\text{ml. NaOH} \times \text{N})}{\text{g. sample}} = \text{g. CaO/gram}$$

When figures for acid value and basicity factor have been determined, the pounds of alkaline agent required per gallon of acid liquor can be quickly found from the accompanying nomograph.

Where acids other than sulfuric, and bases other than lime, are involved, the method outlined can also be readily applied. Since the milliliters of net titrating solution used, times its normality, yields milliequivalents, it is only necessary to multiply this value by 48, divided by the milliliters of sample titrated, to get the grams of equivalent sulfate ion per liter. Similarly, the milliequivalents of alkaline substance multiplied by 0.028 and divided by the grams of sample taken, will yield the grams of equivalent CaO per gram of sample.

Where lime is the neutralizing agent it is customary, in practice, to use an excess of several per cent to reduce the reaction time. Normally, however, the reaction between lime slurry and pickle liquor is complete in about 15 minutes if the mixture is agitated efficiently.

CHART FOR DETERMINING ALKALI REQUIREMENT IN ACIDIC WASTE NEUTRALIZATION

Connect Scales A and B with a straightedge and read the result on Scale C

NOMOGRAPH FOR ACID WASTE TREATMENT

WATER & SEWAGE WORKS, August, 1951

Buffalo's Sludge Digesters with P.F.T. Floating Covers

Some Miseries of Cleaning A Large Digester

Or—What Are Grit Chambers Good For?

by GEO. M. SCHELLER, *Works Supt. and* GEO. F. FYNN, *Chief Chem. Buffalo Sewer Authority, Buffalo, N. Y.*

SEPARATE sludge digestion tanks are incorporated within the physical equipment of a sewage treatment plant for the isolation and decomposition of sewage solids removed from the sedimentation units. By proper control of feed and temperature a reduction in weight and bulky concentration of the solids, decomposition of putrescible organic matter and lowering of disease bacterial content are effected. From an economic standpoint the collection and utilization of the combustible gases derived from the digestion process constitute an important phase in the overall program. The end products of a digestion process are gases, liquids, mineral compounds and non-digestible organic matter known as humus.—That is the description of the ideal.

A radical deviation from that ideal as outlined in the foregoing paragraph may be encountered when an extensive accumulation of sand reduces the effective capacity of a unit after years of operation. This condition mandates a thorough cleaning of a unit in order to regain a semblance of normalcy. Such a task confronted but was accomplished at Buffalo. This article presents a resume of the experience gained during the course of that operation, which resulted in the solution of a difficult problem.

Combined Sewer System

The combined sewer system in Buffalo comprises some 764 miles of sewers, terminating in an interceptor extending 13 miles from the northwest to the southeast boundaries of the city. The sewage carried by the interceptor flows into two 8 foot diameter concrete inverted syphons under a canal to the site of the sewage treatment works on Bird Island. In addition to the grit content of normal sewage, surface run-off from rains and thaws washes into the sewers accumulations of sand and grit from the streets. Much of this sand comes from street sanding operations in the winter. A regular sewer cleaning program prevents excessive build-ups in the various sewers but the average grit content of the sewage determined by grit room operation is 3 cubic feet per million gallons equivalent to 12,000 pounds dry solids per day. Data on maximum ranges indicate peak removals of 100,000 pounds per day.

Due to the high percentage of fines, an appreciable amount of grit passes through the grit chambers and on to the sedimentation tanks. This condition occurs especially during storm periods. Under these circumstances, the offending sandy material is removed with the sludge and pumped to the digestion tanks.

Separate Sludge Digestion Tanks

Four separate sludge digestion tanks of reinforced concrete and masonry with floating covers are used at the treatment works. The tanks are 90 feet in diameter with a sidewall depth of 27.5 feet and a 4 to 1 sloping conical bottom. The low point in the cone is 38.75 feet from the top of the tank wall. In the center of the tank stands a structural steel tower 4½ feet square and about 29 feet high. This tower (see Fig. 1) supports three 8 inch supernatant lines, one 6 inch gas withdrawal line, and a 4 inch circulating line. The 6 inch gas line is located in the exact center and its upper end is enclosed in an 8 inch sleeve or guide, which rides up and down with the cover.

Raw Sludge Feeding Problems

The digester (Tank No. 2) forming the main theme of this article was put into actual service in July, 1938. After a few years of operation it

became evident that the 8 inch raw sludge line as installed posed some problems for optimum operation. Recurrent plugging was encountered and cleaning was unsatisfactory due to the uncertain results attained. The 8 inch cast iron pipe entered a tee inside the wall of the tank. From this point two branches followed around the wall of the tank to opposite sides at mid-point, terminating close to the wall and between the wall and heating coils. The two branches and the tee were eliminated in 1946, and the raw sludge line was extended from the wall straight out about 12 ft. towards the center of the tank. At the time of this revision it was not deemed expedient to totally dewater the unit, although it was evident that there were some accumulations under the original point of discharge of the raw sludge.

Subsequent studies revealed the need for additional alterations. It was found that with only a single point of raw sludge discharge, a considerable portion of the tank was more or less dormant. In 1947 it was decided to make further revisions in the raw sludge feed of No. 1 digester. The revised line had three branches, each of which discharged at one of the third points of the tank and terminated from 6 to 12 feet out from the wall. The three branches were united into a common line outside of the tank and by means of valves the raw sludge flow could be controlled and diverted to any one of the three branches separately. With the installation of external heat exchangers two years ago it became increasingly desirable to make similar changes in the remaining three digesters as soon as possible. Although the revision of tank No. 2 was scheduled for some future date, an unforeseen set of circumstances impelled earlier action.

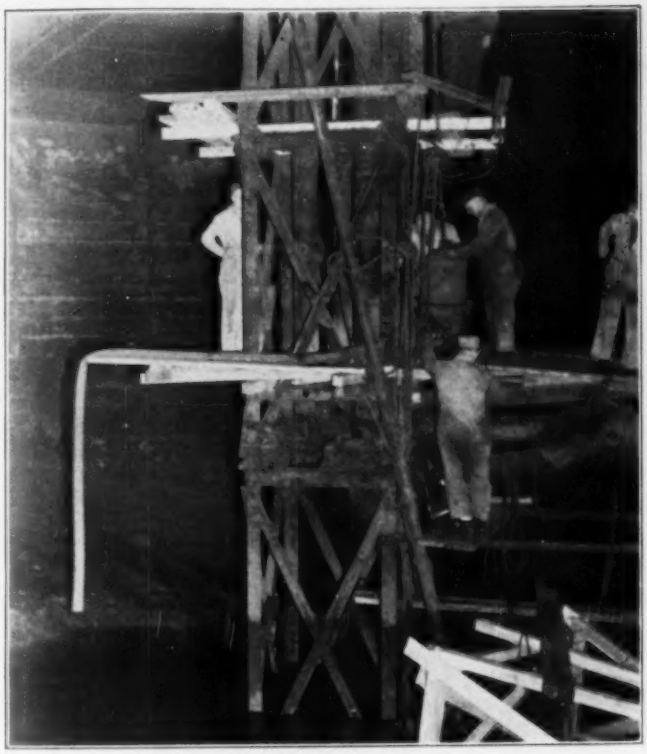


Fig 1—Center Tower Structure—pump being installed

Sludge Inventories

In order to determine the concentration and character of the tank contents, a sludge inventory is conducted on or about the first of each month. A port situated 11½ feet from the center of the dome is the entry point for sampling operations. With a specially designed sampler, constructed by the treatment plant staff for local conditions, portions are withdrawn from the sludge mass at two foot intervals throughout the depth of the tanks.

The results of these inventories together with the analysis of the samples collected are recorded on a graphic representation of a sludge tank as shown in Fig. 2. The horizontal lines drawn on the record represent layers of different density or solids content.

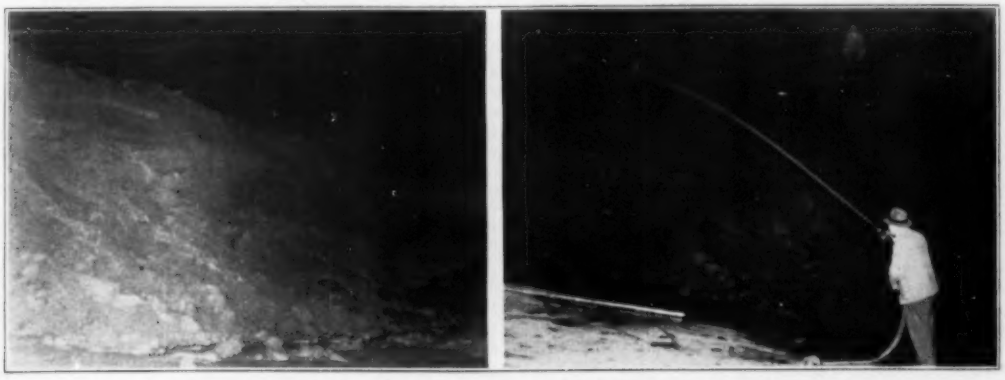


Fig. 1a—Mounds of sand—and method of hosing to pump suction

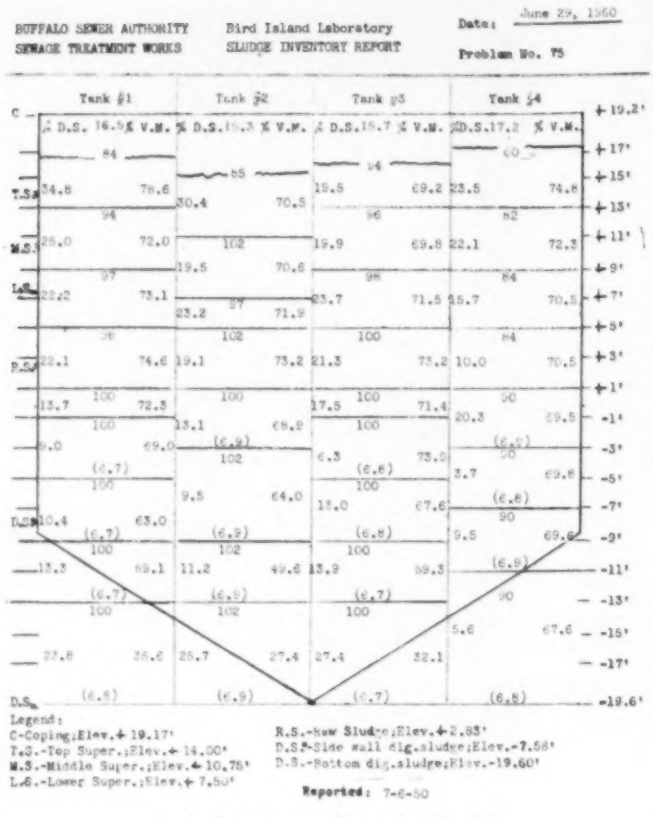


Fig. 2—Sludge Inventory Report—June 29, 1950

For each tank, the number at the left represents the per cent dry solids content in each layer; the number at the right is the per cent volatile matter content of the solids in that layer. The numerical value in the center is the temperature of the layer and figures in parenthesis represent the pH. The number at the top is a reference measurement marking the elevation of the top of the scum layer.

These analytical data together with the measurements are calculated to actual pounds of sludge solids in each layer. The results of the inventory of June 29, 1950 (Fig. 2) are shown in Fig. 3. The changes in any layer since the previous inventory are also recorded, as are the volatile acids at the different elevations.

Shortly after this inventory an outward condition was noted in Tank No. 2, when a considerable amount of sludge-contaminated liquid was found in the gas withdrawal line. Removal of the dome plate revealed that the entire pipe supporting structure in the center was tilted out of position. It was concluded that the weight of the top sludge mass (scum) was the cause of movement in this tower. A complete emptying of the tank contents was necessary to determine the condition at the base of the structure.

Emptying the Tank—No Cinch

Removal of the liquids and the normal sludge presented no problem. Part of the contents was transferred to other units and some pumped to the vacuum filtration units for dewatering and disposal. The removal of the top sludge, however, engendered unanticipated obstacles. Conditions at this stage of operation are shown in the inventory reports dated Sept. 5, 1950 as shown in Fig. 4.

The top surface of the sludge mass was about 20 feet above the 8 inch suction line at the bottom of the tank. More than 1,637,000 lb. of solids were still in the tank. A 1 inch hose, with about 15 feet of pipe at the end, was pushed down into the center of this mass. Hot water was pumped down through this line thereby putting the top sludge in a fluid condition so that it could be withdrawn readily. Removal of this sludge was little more than half completed, when sand moved in and plugged the line so badly that further progress by pumping from the bottom line was out of the question.

For circulating sludge through the external heat exchangers, centrifugal non-clogging sludge pumps are used. These pumps are 4 inch vertical, close-coupled units with a rated capacity of 500 gpm. at a head of 40 feet. Power is derived from a 10 hp., 1150 rpm. motor. One of these pumps was removed from its customary location in the building and suspended in the center of the tank by means of a chain-fall so that it could be lowered as the sludge level dropped. A one inch hose used as supply for liquidfying the concentrated mass did not furnish enough liquid to meet the demands of this pump unit.

To overcome this difficulty, it was decided to use supernatant liquid at about 90°F. from one of the other digesters. Another of these four inch circulating pumps was utilized to deliver the liquor under pressure through a 4 inch pipe line into the tank being emptied. A two inch hose with a nozzle was connected to this line. This setup proved very successful in getting the sludge in a fluid state. It was but a very short time before all the sludge had been removed.

Sand—Mountains of It!

The battle was not yet over, for there still remained two huge piles of material composed of about 70 per cent sand and 21 per cent volatile matter. Rough measurements showed that there were approximately 750 cubic yards of this material. These were huge mounds located at the points where the original (1938-46) raw sludge lines discharged. Movement of this material had been restricted due to the fact that the original mass was held tightly between the wall and heating coils. It was interesting to note that, since the revision of the raw sludge feed lines to a single point 12 feet out from the wall of the tank, no similar accumulations of sand piles were evident under the discharge areas. This change had been in effect for some four years.

Analyses of a composite sample from the sand piles indicate the character of the material encountered:

Constituents	
Dry Solids	67.1 %
Volatile Matter	21.5 %
Silica (dry basis)	70.2%
Grease Content	3.25%
Specific Gravity	1.5

Composition

Water	32.9 lb.
Organic Matter	14.4 lb.
Inorganic Matter	5.6 lb.
Sand	47.1 lb.
	100.0 lb.

The following tabulation details the results of a sieve analysis to determine variations in particle size:

	Retained on	Per Cent	Vol. Mat.
5	mesh screen	1.14	24.8%
10	" "	0.57	49.1%
20	" "	10.00	40.1%
40	" "	26.92	28.9%
60	" "	33.05	15.5%
80	" "	11.67	14.8%
100	" "	7.66	18.7%
150	" "	3.56	19.6%
200	" "	2.89	21.8%
Passed 200	" "	2.52	20.6%

The method of removing the top sludge had proven so successful that it was decided to continue the emptying of the tank contents in the same manner. It was impractical to send this material to other units or attempt a filtration, so other means of disposal had to be provided. Three 2 inch hoses were used for transporting the sand to the pump. One hose cut the sand loose from the bank, the second hose kept it moving towards the pump, and the third hose, equipped with a pipe, was used to agitate the slurry so that the sand would not settle out before the pump could take it away. A good sized lagoon was excavated near the Niagara River bank to receive the sand and slurry. Accompanying photographs are shown to indicate some of the work inside the tank and the sand piles. The diagramatic sketch in Fig. 5 depicts the overall plan of procedure.

TANK	DEPTH Feet	DEPTH Change	SOLIDS 1000 Lb.	SOLIDS Change 1000 Lb.	pH on Graph	VOL. ACIDS p.p.m. Elev-ft
No. 1						
Scum	14.5	+ 2.8	1583.5	+ 755.7		1140 (-2)
Liquor						1120 (-6)
Sludge	20.6	- 4.0	611.2	- 43.9		1030 (-10)
Total	35.1	- 1.2	2194.7	+ 711.8		940 (-14)
No. 2						
Scum	14.3	- 0.9	1315.6	+ 72.3		1180 (0)
Liquor						750 (-6)
Sludge	20.6	0.0	614.7	+ 84.9		560 (-10)
Total	34.9	- 0.9	1930.3	+ 157.2		930 (-14)
No. 3						
Scum	16.7	- 0.1	1378.0	- 61.5		1780 (-2)
Liquor						3030 (-6)
Sludge	18.6	0.0	517.0	+ 62.7		2280 (-10)
Total	35.3	- 0.1	1895.0	+ 1.2		2180 (-14)
No. 4						
Scum	20.2	0.0	1472.6	0.0		
Liquor						
Sludge	16.6	0.0	224.7	0.0		
Total	36.8	0.0	1697.3	0.0		
All Tanks						
Scum			5749.7	+ 766.5		
Liquor						
Sludge			1967.6	+ 103.7		
Total			7717.3	+ 870.2		

Remarks: Change data represent change in 29 days since previous inventory

Fig. 3—Summary of Sludge Inventory—June 29, 1950

Heating Coils Encrusted

This digester had a standard type of heating system, consisting of hot water heating coils around the walls. These coils are made of 3 inch cast iron pipe with threaded joints, resting on hangars suspended from the cover landing brackets. Upon emptying the tank it was found there were approximately 10 ruptures where movement was restricted due to connections through the wall of the tank. The breaks were caused no doubt by pressure from the top sludge as it shifted during the removal operation. The installation of Dresser couplings restored the lines to serviceable condition. Inspection revealed that the surface of the heating coils was covered by a crust varying in thickness from $\frac{1}{8}$ to $\frac{3}{8}$ inches. All of the crust was removed by means of chipping hammers. Improved heat transfer will thus be effected.

With the complete removal of all sludge and sand, an opportunity was afforded to make a thorough inspection of the center structure. It was found that the anchor bolts of three of the legs of the tower had failed. On the fourth leg the weld attaching the leg to the base plate had failed.

To remedy the damage, holes were drilled in the concrete floor adjacent to the tower legs, three quarter inch rods were threaded and screwed into cinch anchors placed in these holes; and the upper ends of the rods were welded onto the legs just above the base plates.

Back in Service

With the completion of all maintenance requirements and pipe revisions, the unit was returned to service by pumping light sewage continously from the sedimentation tanks until the cover was floating. Inasmuch as this operation was necessarily conducted during the winter period, temperature conditions were unfavorable. After completion of the filling operation the sewage was circulated through the heat exchangers until a temperature of 90° F. was reached. At that time some transfer of sludge from other units was made before raw sludge feed was attempted. The tank was continuously vented and gas composition checked until the carbon dioxide content remained below 50

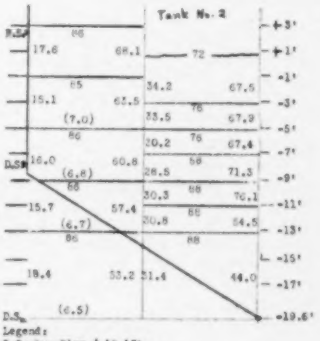


Fig. 4—Sludge Inventory—Sept. 5, 1950

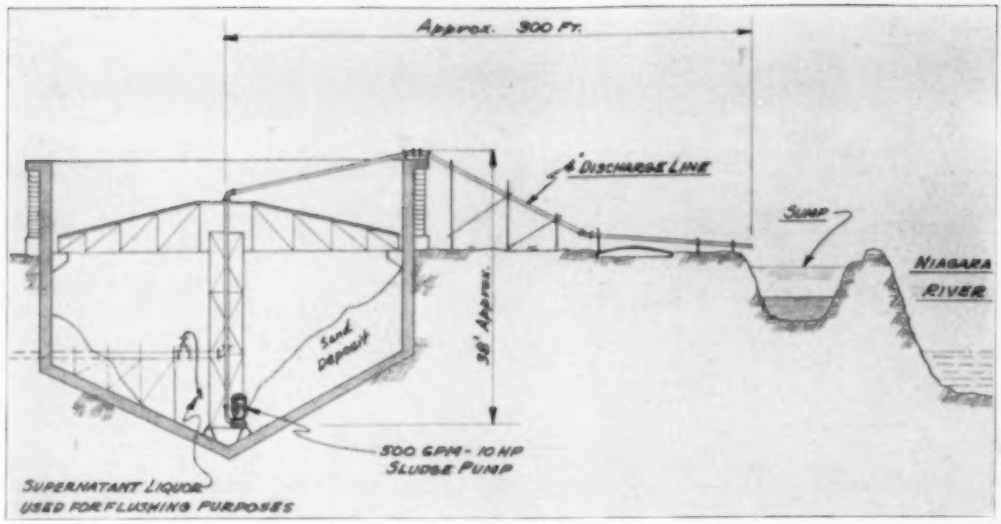


Fig. 5—Depicting method of sand deposit removal from digester No. 2

per cent. All openings were then sealed and the unit returned to active service.

The entire personnel of the plant staff deserves an open expression of gratitude and appreciation for their untiring and persistent efforts in mastering a difficult and troublesome situation. With the experience gained, similar tasks will not be greeted with such dismay and trepidation as was prevalent on this occasion. No crystal ball is necessary to foretell that a similar program must be conducted on three more units.

Eugene Hardin Joins Parsons, Brinkerhoff, Hall and Macdonald

Eugene A. Hardin has joined the staff of Parsons, Brinkerhoff, Hall and Macdonald, N. Y. City engineering firm. He is affiliated with the group headed by G. Gale Dixon which specializes in water supply and sewerage work.

While successively connected with the firms of Black and Veatch of Kansas City and Consoer, Townsend and Quinlan of Chicago, Mr. Hardin designed water and sewage works improvements for a number of municipalities in the central and western part of the country.

More recently Mr. Hardin has had a primary responsibility in the development of plans for the current improvements in the water purification and sewage treatment facilities for the city of Philadelphia, and before that the sewage treatment works and the Springwells Filtration Plant at Detroit.

Correction Please

Harry B. Shaw, Deputy Chief, Wash. Suburban San. Distr. writes us as follows:

"My attention has been called to the article on Page 300 of the July 1951 issue of Water & Sewage Works on the paper "Payment for Changing Utilities in State Highways," which I delivered at the A.W.W.A. conference in Miami. It is stated "According to Mr. Shaw, there is no legal basis for any other concept . . . . . " This is not correct. There is a legal basis for the present concept and I stated, "All of the above is apparently sound law but it is respectfully submitted that its interpretation should be more realistic of the requirements of our modern civilization . . . . . " What you meant to say, I suppose, is that there is no *logical* basis."

We regret the use of the word legal when *logical* was intended.

"OH DARLING! There are two gentlemen down here from the water-works. Remember the bet we made when you changed those little wheels in our meter? Well, it looks like I win!"

Don Carpenter Heads Penna. Prof. Engrs.

J. Don Carpenter, Vice President of Gannett, Fleming, Corddry and Carpenter, Consulting Engineers of Harrisburg, Pa., has been elected President of the Pennsylvania Society of Professional Engineers. The election occurred at the annual meeting of the Society in Allentown, Pa. Mr. Carpenter had previously served the society as State Director, Chairman of Ethics and Practice Committee and Vice-President.

Settling Tank Design

*An Answer to Comments and Criticisms of an Article of the Same Title Published in This Magazine**

by F. POEPEL, *Prof. of Municipal Eng., Technical High School, Stuttgart, Germany.*

THE "comments" of Professor H. M. Gifft[1] and the "protest" by Professor McKee[2] regarding the translation of my article on "Settling Tank Design," which was completely and voluntarily prepared by C. E. Keefer[3], remind me of a discussion of several philosophers. The less well known of them answered the protest made by the elder philosophers against his thesis with the remark that he was glad not to have been overlooked by them.

Professor McKee's remark that one of the constants of equation 11 or 11a is wrong by almost 100% is partly correct. According to Stokes' law the settling velocity s of a solid with a diameter d in a liquid is governed principally by the difference in the specific gravities of the solid and the liquid. A new investigation of Professor Fair's settling tests with solids of different specific gravities in water at 10° C, as reported by Imhoff[4], gave the results in Table 1.

Table -1

Material	Sand	Coal	Sewage Solids
Approximate spec. grav. (g/cm³)	2.65	1.5	1.2
Settling velocity s (cm/sec)	71.2 d^2	18.9 d^2	9.4 d^2
Constant c	71.2	18.9	9.4
Proportional ratio of c	1	0.265	0.132
Difference in spec. grav. (g/cm³)	1.65	0.5	0.2
Proportional ratio of difference in spec. grav.	1	0.303	0.121
Spec. grav. of material if proportional ratio of c is correct (g/cm³)	2.65	1.438	1.218
Difference in approximate spec. gravities and calculated ones (g/cm³)	0	−0.062	+0.018

This new investigation proves that equations 6, 7 and 8 are incorrect and that equations 11 and 11a have to be replaced by:

$$s = 9.4\, d^2 \qquad (A)$$

This is valid only for sewage solids with a specific gravity of approximately 1.2 g/cm³. As all further calculations in my article are based on a value for c of 9.1, the constants of the final recommended formulas have to be altered in a ratio of 9.1 to 9.4 = 1:1.033. Therefore, the error is not 100%, as claimed by McKee, but only 3.3%. The final formulas and the nomograph are valid for sewage solids with a specific gravity of approximately 1.2 gr/cm³.

Settling in Ranges of Laminar and Turbulent Distubance

The above expression has been promoted by A. Casagrande[5] in his report on the utilization of hydrometers o the Bureau of Public Roads in 1931. According to the research work of Casagrande, Stokes' law ($s = c \cdot d^2$) is valid for the settling of suspended solids in the range of laminar disturbance. For the settling of suspended solids in the range of turbulent disturbance Casagrande found a similar law ($s = c_1 d^2$) for the settling velocity.

The data in figure 1 in Camp's article[6] are in good agreement with the explanation of Casagrande. Stokes' law is valid for values of Reynold's number from 10^{-4} to about 0.5. This seems to be the limit for settling in the range of laminar disturbance. For greater values of Reynold's number, settling seems to take place in the range of turbulent disturbance.

Influence of Horizontal Movements on Settling Solids

Experiments indicate that the horizontal movement of water, which is kept within admissible limits, exerts no worth-mentioning influence on the settling of suspended solids. So much for the exact translation of the original article[3]. I should now like to describe the flow conditions in an "ideal settling tank" according to Camp's article.

Camp's equation for the removal ratio r_r of suspended solids is

(Equation 6 *Trans.*, Am. Soc. C.E., 111,910)

$$r_r = \frac{s}{s_o} = s\frac{b\,l}{q} \qquad (B)$$

where q = flow through the tank, s and s_o = settling velocities = overflow rates = $\frac{q}{b\,l}$ the width of the tank is b, the length is l and the water depth is h. In a rectangular tank the flow q is equal to the product of b, h and the horizontal velocity v; hence the removal ratio must also be

$$r_r = s\frac{b\,l}{b\,h\,v} = s\frac{l}{h\,v} \qquad (C)$$

While equation B shows the influence of the overflow rate on the removal ration, equation C shows the influence of the water depth and the horizontal velocity on the removal ratio. This statement has nothing to do with "mathematic trickery," but it is only a scientific separation of the various influences affecting the settling capacity of an "ideal basin." These influences are the following three:

1. The settling velocity of suspended solids in the range of laminar disturbance is
$$s = c\,d^2$$
which acts downwards:
q is the quantity of sewage to be handled in a settling tank of a given size b, l and h. This establishes:
2. The overflow rate $\frac{q}{bl}$, which acts in an opposite direction to the settling velocity and
3. The horizontal velocity $v = \frac{q}{b\,h}$ which acts vertical to influences 1 and 2.

Suspended solids of a certain size will settle in a settling tank if their settling velocity is greater than or at least equal to the overflow rate.

$$s = c\,d^2 = \frac{q}{b\,l} \text{ or } d = \sqrt{\frac{q}{b\,l\,c}} \qquad (D)$$

Settling of suspended solids will be completed in an "ideal basin" if the flowing through time $t = \frac{l}{v}$ equals their settling time $t_s = \frac{h}{s}$.

$$t = t_s = \frac{l}{v} = \frac{h}{s}$$

Hence,
With $s = c\,d^2$ and solving for d it follows that

$$\frac{l}{h} = \frac{v}{c\,d^2} \text{ and } d = \sqrt{\frac{h}{l\,c}} \cdot \sqrt{v} \qquad (E)$$

*W.&S.W. Oct. 1950 (p422) and Feb. 1951 (p89)

While equation D shows d to be a function of the overflow rate, equation E shows d to be a function of the horizontal velocity and the depth of the tank. Equations B and C for the removal ratio are compared with those (D and E) developed for the diameter of the suspended solids retained.

Influences	Removal Ratio	
Influence of overflow rate	$r_r = s \cdot \frac{b \cdot l}{q}$	(B)
Influence of horizontal veloc.	$r_r = s \cdot \frac{l}{h \cdot v}$	(C)

Diameter of Solids

$$d = \sqrt{\frac{q}{b \cdot l \cdot c}} \qquad (D)$$

$$d = \sqrt{\frac{h}{l \cdot c}} \cdot \sqrt{v} \qquad (E)$$

Obviously the removal ratio will be increased when the diameter of the suspended solids decreases. Therefore, the equations for r_r and for d must be reciprocal in principle. This is the case relative to the two influences. Equations B and D, which reveal the influence of the overflow rate, prove the well known thesis that the *clarification* effect of a settling tank *is a function of the overflow rate*. Equations C and E, which are based on the combined effect of settling velocity and horizontal velocity, prove that the removal ration and the diameter of the suspended solids removed are also a function of the water-depth and the horizontal velocity. The influences are identical on both the removal ratio and the diameter of the solids. If the product of h and v decreases, the removal ratio increases and the diameter of the solids removed decreases. A combination of equations B and C with respect to D and E leads in both cases to the result that the flow through the tank is equal to the product of water depth, tank width and the horizontal velocity. This proves again that the development of equations B to E is correct.

The comparison of the equations for the removal ratio with those for the diameter of solids removed proves that all the "comments" of Professor Gifft, relating to the horizontal flow are incorrect, as he neglects the influence of the horizontal velocity or the settling time, which exists and which was established years ago by Dr. Imhoff[4].

Ratio of Horizontal and Settling Velocity

There remains Prof. Gifft's criticism of my assumption that the ratio of the horizontal and settling velocity should be a hyperbolic function, as indicated by a quotient obtained by dividing a constant by the diameter of the suspended solids to be removed.

$$\frac{v}{s} = \frac{c^1}{d} \qquad (F)$$

As the value for d can be replaced according to Stokes' law by

$$d = \sqrt{\frac{s}{c}}$$

it follows that:

$$v = c^1 \cdot \sqrt{cs} \qquad (F^1)$$

With c = 94 (according to equation 11 of the Keefer translation[3]) in mm/sec it follows that:

$$v = c^1 \cdot 9.70\sqrt{s} \qquad (F^2)$$

The value c^1 has been determined with the help of the primary settling tanks at the Paris-Acheres disposal plant with an overflow rate of 2.20 meters per hr. = 1,295 gal./sq. ft./day to be 0.435. With regard to the alteration of the constant in equation 11 from 9.1 to 9.4 the value for c^1 must become 0.428. If s is assumed to be 1 meter per hour (0.2785 mm/sec.), the horizontal velocity becomes

$$0.428 \cdot 9.70\sqrt{0.2785} = 2.19 \text{ mm. per sec.}$$

Hence equation F^2 can be written in the more general form

$$v = 2.19\sqrt{s} \text{ mm. per sec.} \qquad (F^3)$$

If in equation F^3 the settling velocity or overflow rate is expressed in meters per hour, the horizontal velocities will be in mm/sec.

In Table 2 the horizontal velocities have been calculated by means of equation F^3 for various overflow rates or settling velocities.

This table indicates that in a tank to be designed for the removal of solids with a settling velocity of 3.0 m/hour a horizontal velocity of 3.80 mm/sec should be provided. In a tank to be designed for the removal of solids having a settling velocity of 1.5 m/hour the horizontal velocity should be decreased to 2.68 mm/sec.

In the discussion of Camp's paper on sedimentation[5] Mr. Lynn Perry gives a trustworthy formula for the horizontal velocity of water in which solids of various sizes will settle (Trans. Amer. Soc. C. E., 119, 944)

Table -2

Overflow (gal./sq. ft./day)	294	588	882	1176	1295	1470	1765	2058
Ratio (m./hr.)	0.5	1.0	1.5	2.0	2.2	2.5	3.0	3.5
Diameter of Solids (μ)	38.5	54.5	66.6	77.7	80.7	86.1	94.4	101.8
Horizontal Velocities (mm/sec)	1.55	2.19	2.68	3.1	3.25	3.47	3.80	4.1

$$v = 424\ (G_r - 1)\ d^2 \text{ mm/sec.}, \qquad (G)$$

Where G_r = spec. gravity of solids. This equation has exactly the same form as Stokes' law for the settling velocity. If it should also be valid for the horizontal velocity, the constant of this equation would be different from that for the settling velocity. By comparing the constants for the horizontal and settling velocities it should be possible to find the ratio of $\frac{v}{s}$. The results of Prof. Fair's settling tests with sand, coal and sewage solids (Table -1) are used for the calculation of these ratios given in Table 3. This comparison shows that Mr. Lynn Perry proposes to make the horizontal velocity equal to the settling velocity. This suggestion, however, seems to give too low horizontal velocities and therefore too deep settling tanks. In the primary settling tank at the Paris-Acheres disposal plant the "average radial velocity" was 5.3 times greater than the settling velocity. In the final settling tank at Amsterdam—West the ratio of $\frac{v}{s}$ was 2.75.

Therefore, the exact value of the ratio of the horizontal and the settling velocities has still to be determined by detailed experiments. It seems, however, that my assumption will give results which are in the range of probability. Therefore, the comments of Professor Gifft[1] regarding this assumption must be considered unjustified. After having proved by a "very simple" modification of Camp's equation for the removal ratio of suspended solids in ideal settling tanks, that their clarification ability is both a function of the settling velocity or overflow rate and of the horizontal velocity or depth, which Professor McKee admits in paragraph one of his "Summary of Theory and Practice", and which is also the result of my investigation in the original German article, there is left no reason for his "Protest."[2]

As to the Influence of Flocculation

The influence of flocculation was

Table 3.

Material	Sand	Coal	Sewage Solids
Diff. in spec. grav. ($G_r - 1$) in g/cm³	1.65	0.438	0.218
Settling velocity c^w $(G_r - 1)d^2$ in mm/sec	$432 \times 1.65\ d^2$	$432 \times 0.438\ d^2$	$432 \times 0.218\ d^2$
Horizontal velocity in mm/sec	$424 \times 1.65\ d^2$	$424 \times 0.438\ d^2$	$424 \times 0.218\ d^2$

mentioned in my original German article and discussed 8 to 9 years ago in detail in three articles 7, 8, 9. There is no doubt that a particle settling in an ideal cylindrical tank follows a curvilinear path, for which Professor McKee has given the formula under the assumption that the settling velocity of this particle is great enough for it to settle from the water level to the tank bottom. The particle needs, therefore, a settling time (determined by the ratio of water depth and settling velocity) and an available detention time (the ratio of the tank volume and the flow) together with the ratio of the horizontal projection of the path of the particle and the average radial velocity. Therefore, when fixing the dimensions for an ideal tank as a whole, in which these three kinds of time are equal, it is possible to calculate the average radial velocity without getting incorrect results. For detailed investigations of a certain part of the tank or for controlling the path of the particle the actual velocity has to be taken into account as suggested by Professor McKee. His remarks under the heading "Basis of Concept"[4] confirm therefore the method of calculation, adopted for fixing the dimensions of a circular settling tank in the original article on the one hand and limit its range of validity for detailed investigation on the other. According to Professor McKee's remarks, my conclusion that the width of a rectangular tank should be about three times the length does not correspond with modern American results. Most American engineers are (I agree completely after having seen this plant in November, 1950) proud of the most modern and largest activated sludge plant "Hyperion" at Los Angeles, Calif. Some of the best known consulting engineers in the United States assisted Mr. Parker in the design of this plant. A check of the primary rectangular settling tank shows: length 300 ft. and total width $8 \times 56.5 = 452$ ft. The ratio:

$$\frac{b}{l} = 1.51$$

For final clarification the 4 groups of 5 rectangular clarifiers provided are 125′ long and $5 \times 76' = 380'$ wide. The ratio:

$$\frac{b}{l} = 3.04$$

The ratio of total width to length of the rectangular clarifiers for primary or secondary settling in most of the large sewage disposal plants which I saw last fall was between 1.5 and 3.0. This indicates that my conclusions about the required dimensions of rectangular clarifiers are fairly well in line with modern American practice. On the other hand it also confirms Professor McKee's conclusion that rectangular tanks are most suitable for large installations where the size of the tanks can be chosen in such a form that the ratio of total width to length varies between 1.5 and 3.0.

References

(1) "Settling Tank Design," comments and criticisms of the article by F. Pöpel, *Water and Sewage Works*, February, 1951, (89-92.)

(2) "Settling Tank Design," a résumé of a paper by F. Pöpel, translated by C. E. Keefer, *Water and Sewage Works*, October, 1950, (422-425.) (Bemessung von Absetzbecken, *Gesundheits Ing.* 1949, Heft 15/16.)

(3) K. Imhoff. "Taschenbuch der Stadtentwässerung." Verlag Oldenburg, München, 4—13 Auflage.

(4) A. Casagrande, "Die Aeormeter-Methods zur Bestimmung der Kornverteilung von Böden und Anderen Materialien." Julius Springer Verlag, Berlin, 1934.

(5) Thomas R. Camp, "Sedimentation and the Design of Settling Tanks." *Transactions, Am. Soc. of Civil Engrs.* Paper N. 2285, (895-958.)

(6) K. Imhoff. "Zur Berechnung der Absetzbecken." *Gesundheits Ing.*, 1925, Heft 25.

(7) F. Pöpel. "Die Absetz-und Schwebestoffkurven Gemeindlicher Abwässer," *Gesundheits Ing.*, 1942, Heft 39/40.

(8) F. Pöpel. "Die Ausscheidung der Feststoffe Städtischer Abwässer im Ständig Durchflossenen Absetzraum." *Gesundheits Ing.*, 1942, Heft 49/50.

(9) F. Pöpel. "Die Mechanische Ausflockung der Schwebestoffe Gemeindlicher und Industrieller Abwässer," *Gesundheits Ing.*, 1943, Heft 17.

A Discussion

by C. E. KEEFER, *Deputy Sewage Engr., Baltimore, Md.*

Professor Gifft's discussion[1] of my resume of professor Poepel's article[2] on the design of settling tanks deserves comment. Professor Poepel's article, which contained a number of graphs and considerable tabular data, was for the sake of brevity reduced to about half of its original length. If the entire article had been published, the continuity of Professor Poepel's thoughts would perhaps have been presented more clearly. Although a considerable portion of the original article was abbreviated, a large part of the resume is a literal translation of the original.

If the resume should lack clarity, it is the responsibility of the writer and not of Professor Poepel, who presented his theories clearly and concisely.

The resume was not intended for the unscientific reader uninitiated in the theories of sedimentation. For that reason no attempt was made to define and explain the various technical expressions that were used. In the first part of Professor Gifft's discussion he refers to the use of the expression laminar and turbulent flow and states that "the implication is that there is a flow of sewage through some sort of settling basin." These expressions in the resume are used in connection with a discussion of Stokes' law. This law relates to the vertical flow or movement of solids in suspension in a liquid under the force of gravity and has no connection with the horizontal flow of a liquid in a tank or receptacle. There is nothing in Professor Poepel's original article or in my resume to indicate such a connection. I see no reason for the confusion in the reader's mind that Professor Gifft speaks of; anyone familiar with Stokes' law should have no difficulty in correctly interpreting the meaning that was intended. Professor Gifft apparently had no such difficulty.

As Professor Gifft has correctly pointed out, the word "turbulent" should be substituted for "laminary" in the tenth line of colume 2, page 422.

Professor Gifft discusses the use of the expressions laminary and turbulent zones. These zones refer to the ranges of the velocities of particles of different sizes settling in a liquid, the larger particles settling at a higher velocity in the turbulent zone and the smaller particles settling at a lower velocity in the laminary zone. Although Professor Gifft suggests the use of the word "range" for "zone" in the above-mentioned connection, the word "zone" gives the meaning that was intended. Here again the discussion involved the use of Stokes' law as applied to solids settling in grit chambers. As this law deals with vertical velocities produced by the force of gravity only, laminary or turbulent zones of disturbance produced by any other forces play no part in the discussion.

THE EDITOR'S COMMENTS

Uniformity Needed in Pollution Legislation

In recent months the need for greater uniformity in pollution control legislation by the individual states has been coming more and more to the front.

Arguments for such a desired pattern were voiced on this page when congressional hearings were being held on the proposed Public Law 845, and other anti-pollution bills before Congress. Several of our lawmakers were at the time advocating outright Federal control of stream pollution as more practical than individual State control. The principal arguments were that the States had failed to make existing laws work and, that a Federal law would be more practicable on the score that any pollution control law should be of a uniform nature for the country at large and enforced equally in all parts of the country. Further, that non-uniformity of individual State legislation would not meet requirements and would lead to confusion and inequitable treatment of polluters.

The need for greater uniformity in pollution control legislation was forcibly brought out at the recent meeting of the Manufacturer's Chemists Assn. Conference on Pollution Abatement, as reported in our July issue. In the report of MCA's Committee on Legal and Regulatory Aspects, Chairman W. G. Reynolds, a DuPont attorney, together with others on his committee, pointed to the present complexity and non-uniformity of pollution control acts in the various States, and cited the undesirable features and difficulties created by such heterogeneity of existing laws. On all sides the prayer of the industrial legal group was for greater uniformity in pollution laws and standards which industry must meet. What will apply in one State may not in another.

Without having heard the plea of the attorneys E. J. Cleary, Exec. Director and Chief Engr. of the Ohio River Sanitation Commission, in his dinner address stressed, among other things, the need for greater uniformity of State pollution control laws. Mr. Cleary, with eight states in the Ohio River Compact, and two years of experience, we must assume spoke with good reason.

The U. S. Public Health Service has made an initial move in the direction of promoting uniform legislation in its development of what might be termed a guide to uniform pollution control legislation. The industrial attorneys appraised this so-called "Model Act" as being something less than wholly satisfactory, but definitely considered it a good start in the right direction.

With the above appraisal we are in agreement. The important consideration, as this writer sees it, is that a lack of a fair degree of uniformity in State laws, regulations, standards and enforcement processes constitutes a highly dangerous situation. Such a situation should not be permitted by the States to exist if they do not wish to have Federal control displace State control in time.

As matters now stand control of stream pollution at the state level is undergoing a period of test, during the life of Public Law 845. All fair minded judges can but agree that the 10-year trial of state control, which P.L. 845 provides, should be a sufficient period in which to test its practicability and adequacy.

Although born and reared a state's-righter, this writer can not help but feel that the various state water control authorities should be looking in the direction of protecting their positions before it is too late. The first step should be a careful review of their present pollution abatement laws and regulations, with the objective being a reshaping of existing regulations, standards, penalties etc. in the direction of establishing uniformity amongst the states in pollution control policy and practice to the maximum permissible degree. Not to do so is to play squarely into the hands of those who want to see Public Law 845 proven a failure.

What is Fluoridation?

Newspapers, nation-wide, are giving more and more space to the question of water fluoridation. The latest lot of clippings reaching our desk are almost universally in favor of local adoption of fluoridation, on the grounds that evidence is all in its favor as a safe measure for improving the dental health of oncoming generations. One recent UP dispatch states that 95 progressive cities have adopted fluoride treatment of their water supplies. Another reports that a well-known water bottling concern of Minneapolis, a distributor of bottled spring water for 66 years, is now serving fluoridated water to all customers except those who specify un-fluoridated water.

Two recent items indicate that Christian Science groups are raising the question—"Is fluoridation medication?"—if so they want no part of this form of "State Medicine." This constitutes a legitimate question, and creates another, namely—*"What is fluoridation?"* Is it medication? Possibly so, if one subscribes to homeopathy as the practice of medication. But, on the other hand, one may more appropriately consider such trace dosages of fluorides added to drinking water as a measure for the correction of a diet deficiency, rather than as a medication procedure.

In the field of nutrition the specialist would refer to fluoride in such minute quantities as a trace-element. Such trace-elements are often considered highly important in many diets—especially to the healthy growth of vegetables and fruits. Such essential trace elements are now commonly designated "micro-nutrients" because of their importance in minute quantities for adequate nutrition. Amongst the better known "micro-nutrients" are copper, zinc, boron, cobalt and iodine. Now, it may well be that the nutrition specialists will soon be adding fluorine to the list as an important "micro-nutrient" in the diet of children.

It is this writer's impression that the Am. Water Works Assn.'s Committee on Fluoridation and also the AWWA Board of Directors, in considering the question of fluoride addition to water supplies, never for once looked upon fluoridation as other than a mineral fortification procedure, applicable to waters naturally deficient in this trace element; or, "micro-nutrient" should we say?

Abel Wolman

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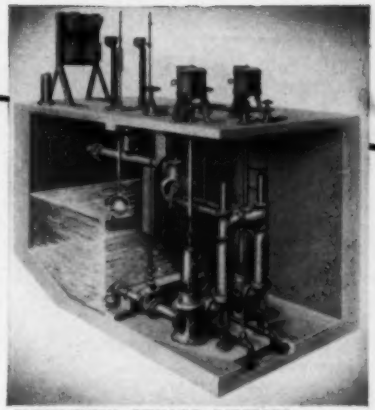

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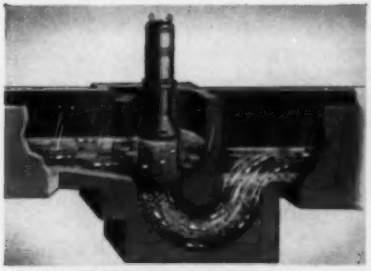

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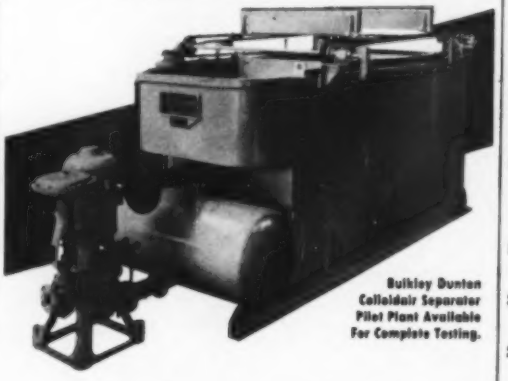

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Aug. 8—Willow, Me.
MAINE WATER UTILITIES ASSOCIATION. Sec'y, Earle A. Tarr, Winthrop, Me.

Aug. 20-22—Toronto, Ont. *(Royal York Hotel)*
CANADIAN INSTITUTE ON SEWAGE & SANITATION. Sec'y, A. E. Berry, Parliament Buildings, Toronto, Ont.

Aug. 20-22—State College, Pa. *(Nittany Lion Inn)*
PENNSYLVANIA WATER WORKS OPERATORS' ASSOCIATION. Sec'y, R. Rupert Kountz, Penna. State College, State College, Pa.

Aug. 22-24—State College, Pa. *(Nittany Lion Inn)*
PENNSYLVANIA SEWAGE & INDUSTRIAL WASTES ASSOCIATION. Sec'y, B. S. Bush, Dept. of Health, Kirby Health Center, Wilkes-Barre, Pa.

Aug. 21-25—Miami Beach, Fla. *(Floridan Hotel)*
NATIONAL ASSOCIATION OF SANITARIANS. Wm. J. McLarty, Program Comm., 1256 W. 7th St., Los Angeles, Calif.

Sept. 10-12—Boston, Mass. *(Hotel Statler)* NEW ENGLAND WATER WORKS ASSOCIATION (Annual convention). Sec'y, Jos. C. Knox, 73 Trement Street, Boston 8, Mass.

Sept. 11-12—Kentville, Nova Scotia *(Cornwallis Inn)*
MARITIME BRANCH Canadian Section AWWA, Secy. J. D. Kline, Public Service Comm., Halifax, Nova Scotia.

Sept. 11-13—Marshalltown, Iowa *(Hotel Tall Corn)*
IOWA SEWAGE WORKS ASSOCIATION. Sec'y, Leo Holtcamp, P.O. Box 310, Webster City, Ia.

Sept. 12-14—Minneapolis, Minn. *(Hotel Nicollet)*
MINNESOTA SECTION A.W.W.A. Sec'y, Leonard N. Thompson, 216 Court House Bldg., St. Paul, Minn.

Sept. 13-14—Whiteface, N.Y. *(Whiteface Inn on Lake Placid)* NEW YORK SECTION A.W.W.A. Sec'y, Rollo K. Blanchard, 50 West 50th Street, New York 20, N.Y.

Sept. 16-19—Detroit, Mich. *(Veterans Memorial Bldg.)*
AMERICAN PUBLIC WORKS ASSOCIATION. (Annual Convention). Director, D. F. Herrick, 1313 East 60th St., Chicago, Ill.

Sept. 17-19—Louisville, Ky. *(Kentucky Hotel)*
KENTUCKY-TENNESSEE SECTION A.W.W.A. and KENTUCKY-TENNESSEE INDUSTRIAL WASTES & SEWAGE WORKS ASSN.
Sec'y, R. P. Farrell, 420 Sixth Ave., N., Nashville 3, Tenn.

Sept. 19-21—St. Joseph, Mich. *(Whitcomb Hotel)*
MICHIGAN SECTION A.W.W.A. Sec'y, T. L. Vander Velde, 2609 E. Saginaw Street, Lansing 12, Mich.

Sept. 19-21—Atlanta, Ga. *(Georgia Institute of Technology)*
GEORGIA WATER & SEWAGE ASSOCIATION. Sec'y, A. T. Storey, 1210 Hempkill Ave., N.W., Atlanta, Ga.

Sept. 19-21—Yankton, S. Dak. *(Charles Gurney Hotel)*
SOUTH DAKOTA SECTION A.W.W.A. and SOUTH DAKOTA SEWAGE WORKS ASSOCIATION. Sec'y, Chas. E. Carl, State Board of Health, Pierre, S. Dak.

Sept. 19-21—Philadelphia, Pa. *(Stratford Hotel)*
PENNSYLVANIA SECTION A.W.W.A. Sec'y, L. S. Morgan, Dept. of Health, Greensburg, Pa.

Sept. 24-25—Denver, Colo. *(Cosmopolitan Hotel)*
ROCKY MOUNTAIN SECTION A.W.W.A. Sec'y, Geo. J. Turre, P.O. Box 600, Denver, Colo.

Sept. 26—Denver, Colo. *(Cosmopolitan Hotel)*
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Sept. 24-26—Biloxi, Miss. *(Buena Vista Hotel)*
ALABAMA-MISSISSIPPI SECTION A.W.W.A. Sec'y, Chas. W. White, 519 Dexter Ave., Montgomery, Ala.

Sept. 25-27—Milwaukee, Wis. *(Hotel Pfister)*
WISCONSIN SECTION A.W.W.A. Sec'y, Leon A. Smith, City Hall, Madison 3, Wis.

Sept. 26-28—Fargo, N.D. *(Gardner Hotel)*
NORTH DAKOTA WATER & SEWAGE WORKS CONFERENCE. Sec'y, Jerome H. Svore, State Dept. of Health, Bismarck, N.D.

Sept. 27-28—Saskatoon, Sask. *(Bessborough Hotel)*
WESTERN CANADA WATER & SEWAGE CONFERENCE. Sec'y, H. C. Lindsten, 301 Hamilton Bldg., Winnipeg, Can.

Sept. 27-28—Toledo, Ohio *(Commodore Perry Hotel)*
OHIO SECTION A.W.W.A. Sec'y, F. P. Fischer, 812 Perry Payne Bldg., Cleveland 13, Ohio.

Sept. 29—Livingston, N.J. *(Doerr's Grove)*
NEW JERSEY SEWAGE & INDUSTRIAL WASTES ASSOCIATION. (12th Annual Outing). Sec'y, Michael S. Kachorsky, P.O. Box 766, Manville, N.J.

Sept. 30-Oct. 2—St. Joseph, Mo. *(Robidoux Hotel)*
MISSOURI SECTION A.W.W.A. MISSOURI WATER & SEWAGE CONFERENCE. Sec'y, Warren A. Kramer, State Office Bldg., Jefferson City, Mo.

Oct. 3-4—Charleston, W. Va. *(Daniel Boone Hotel)*
WEST VIRGINIA SEWAGE & INDUSTRIAL WASTES ASSOCIATION. Sec'y, Glen O. Fortney, State Health Department, Charleston, W. Va.

Oct. 4-5—Charleston, W. Va. *(Daniel Boone Hotel)*
WEST VIRGINIA SECTION A.W.W.A. Sec'y, H. K. Gidley, State Department of Health, Charleston 5, W. Va.

Oct. 8-11—St. Paul, Minn. *(Municipal Auditorium)*
FEDERATION OF SEWAGE & INDUSTRIAL WASTES ASSN'S. (Annual Convention) W. H. Wisely, 325 Illinois Building, Champaign, Ill.

Oct. 14-17—Fort Worth, Texas *(Hotel Texas)*
SOUTHWEST SECTION A.W.W.A. Sec'y, L. A. Jackson, Memorial Auditorium, Little Rock, Ark.

Oct. 18-20—Corpus Christi, Texas
NATIONAL ASSOCIATION OF CORROSION ENGINEERS. (South Central Region.) Sec'y, A. B. Campbell, 919 Milam Building, Houston, Tex.

Oct. 22-25—New York, N.Y.
AMERICAN SOCIETY OF CIVIL ENGINEERS. (Annual Meeting). Sec'y, William N. Carey, 33 West 39th St., New York 18, N.Y.

Oct. 23-26—Atlantic City, N.J. *(Hotel Claridge)*
PENNSYLVANIA WATER WORKS ASSOCIATION. Sec'y, W. A. Kufs, 510 Telegraph Bldg., Harrisburg, Pa.

Oct. 23-26—San Francisco, Calif. *(Fairmont Hotel)*
CALIFORNIA SECTION A.W.W.A. Sec'y, Wm. W. Aultman, Box 38, LaVerne, Calif.

Oct. 25-27—Dubuque, Iowa *(Hotel Julian)*
IOWA SECTION A.W.W.A. Sec'y, H. V. Pedersen, Municipal Bldg., Marshalltown, Iowa.

Oct. 25-27—Atlantic City, N.J. *(Madison Hotel)*
NEW JERSEY SECTION A.W.W.A. Sec'y, C. B. Tygert, Box 178, Newark 1, N.J.

Oct. 28-31—Daytona Beach, Fla. *(Sheraton Plaza Hotel)*
FLORIDA SECTION A.W.W.A. and
FLORIDA SEWAGE & INDUSTRIAL WASTES ASSOCIATION. Sec'y, Perry M. Teeple, P.O. Box 210, Jacksonville, Fla.

Oct. 29-Nov. 2—San Francisco, Calif. *(Civic Auditorium)*
AMERICAN PUBLIC HEALTH ASSOCIATION. (Annual Meeting) Sec'y, Mrs. W. R. Walsh, 1790 Broadway, New York, N.Y.

Oct. 31-Nov. 2—Baltimore, Md. *(Sheraton Belvedere Hotel)*
CHESAPEAKE SECTION A.W.W.A. Sec'y, Carl J. Lauter, 5902 Dalecarlia Place, N.W., Washington 16, D.C.

Nov. 6-7—Providence, R.I. *(Sheraton Biltmore Hotel)*
NEW ENGLAND SEWAGE WORKS ASSOCIATION. Sec'y, Walter E. Merrill, 511-A State House, Boston, Mass.

Nov. 7-9—Roanoke, Va. *(Hotel Roanoke)*
VIRGINIA SECTION A.W.W.A. Sec'y, W. H. Shewbridge, 708 State Office Bldg., Richmond 19, Va.

Nov. 12-14—Winston-Salem, N.C. *(Robert E. Lee Hotel)*
NORTH CAROLINA SECTION A.W.W.A. and
NORTH CAROLINA SEWAGE & INDUSTRIAL WASTES ASSN. Sec'y, E. C. Hubbard, State Board of Health, Raleigh, N.C.

Dec. 3-7—Stillwater, Okla. *(Oklahoma A. & M.)*
OKLAHOMA WATER, SEWAGE & INDUSTRIAL WASTES CONFERENCE SHORT SCHOOL. Director, Foster S. Burba, Eng. Bldg., Okla. A. & M. College, Stillwater, Okla.

Dec. 10-14—Stillwater, Okla. *(Oklahoma A. & M.)*
OKLAHOMA WATER, SEWAGE & INDUSTRIAL WASTE CONFERENCE. Sec'y, H. J. Darcey, State Dept. of Health, Oklahoma City 5, Okla.

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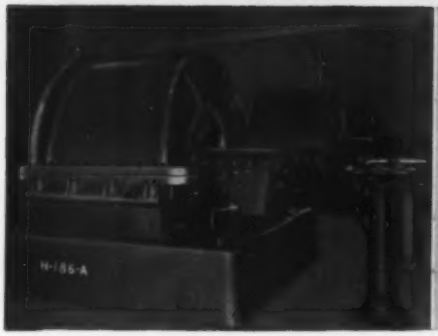

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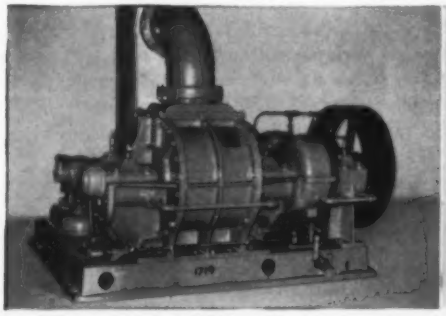

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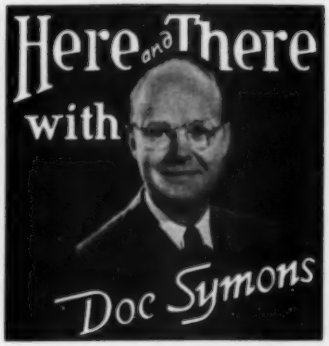


H.T.M.A.—And I'm well aware that last month, I promised I'd continue with the story of the AWWA Convention in Miami, but—that just has to wait—and here's why.—On page 88A of last month's column, I said, "Right now there's a couple of items left over that didn't get into the last column"—If you read the next item you must have been a little confused, for the column went right on talking about the Miami Convention.—Not only were the left-over items not included, but the Council Bluffer's item was actually out of place.

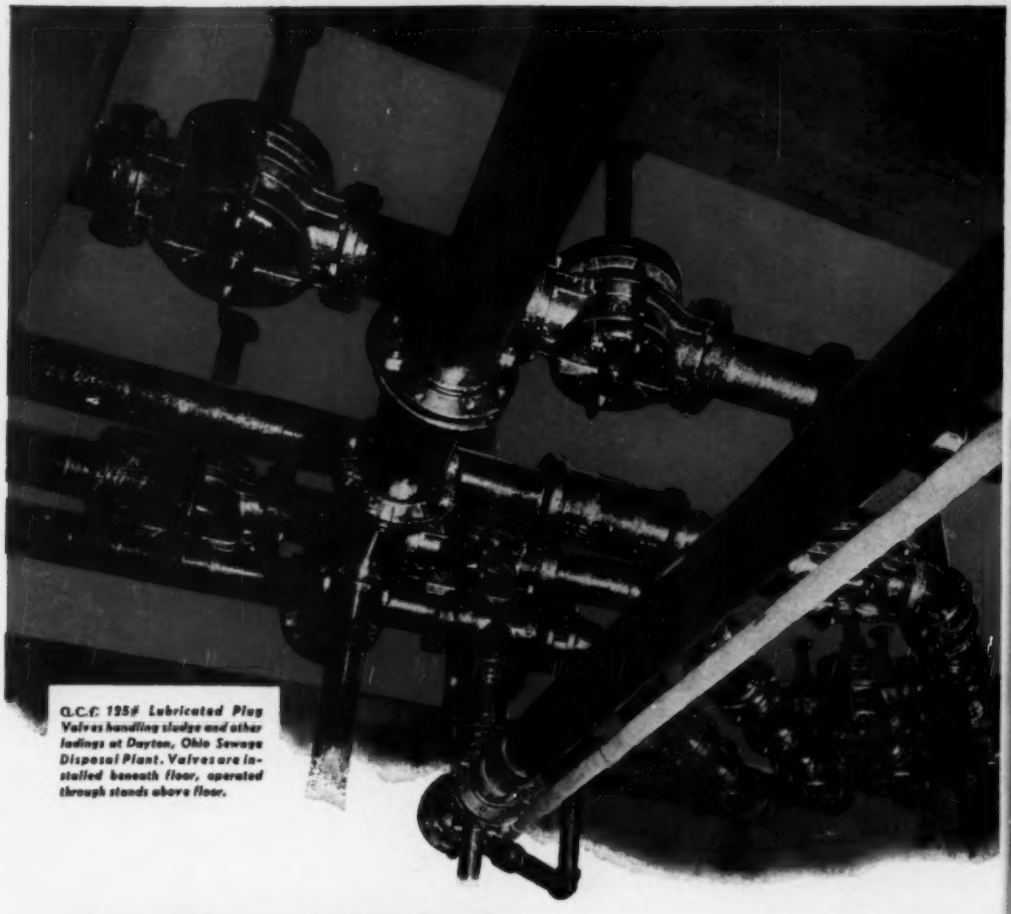
Well—That's what happens to columnists, when the Make-up Editor finds space limitations makes necessary switching some items and leaving others out. Before any more such difficulties arise this month, I'm going to do the left-overs first. Also, because I'm a bit late in getting this copy in, I'm going to include a number of items I had already written and had on file for emergency use. That means you'll have to wait until next month for the remainder of my story on the Miami Meeting.—Do you mind???

* * *

At the Purdue Industrial Waste Conference (than which there is no whicher), Maurice LeBosquet, Jr., the Industrial Waste Expert of the USPHS Cincinnati Office, was telling of a new idea in the presentation of technical papers at meetings.

I had been scheduled to present a paper at the Penna. Sew. & Ind. Wastes Assn. in State College, last August, and LeBosquet and E. Sherman (Metcalf and Eddy) Chase were the scheduled discussers, each to have 5 or 10 minutes. Came the meeting and I was sick and hadn't written the paper, but that didn't prevent LeBosquet and Chase from taking the whole hour to give a discussion of it. The audience was so pleased that LeBosquet now says, "the formula for a

(Continued on page 86A)



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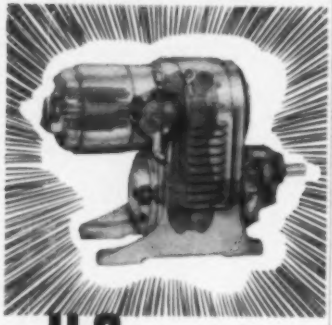

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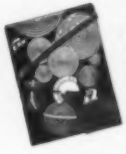

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City Zone State

(Continued from page 82A)

good meeting is to schedule Doc Symons for a talk with two discussers and then don't let Doc talk—I guarantee success."

* * *

The N.J. Sew. & Ind. Waste Assn. held its meeting in Atlantic City this past March; the first time in 36 years they haven't met in Trenton. The sessions were held in a wonderful lecture room on Floor M. (the 13th letter in the alphabet). Aside from the comfortable seats, wonderful acoustics, and other facilities, the members were fascinated by the names that ran around a border near the ceiling—Gorm, Odin, Wodan, Halfdan, Fridthjof, and Herald Bluetooth—a long way from Grit, Odor, Waste, Half-Life, Venturi Weir, and Methylene Blue.

* * *

If you ever play golf around the northern part of New Jersey or especially at the State College, Pa., meetings in August, look out for a fellow named "Cliff" Morelli of Infilco, Inc.

"Cliff's" name is registered in the Golfing Hall of Fame at Canton, Ill., where he stepped up to the first tee for the first time and promptly whacked the ball into the cup 167 yards away. And he has a newspaper clipping to prove it. Cliff doesn't say much about the rest of that round, but usually he's a low handicapper.

And by the way, I wonder how my favorite golf champ Earle (W&T) Johnson of Pittsburgh is these days. Heard he was under the weather a while back.

* * *

We were sitting at the famous "Speechless Dinner" of the N.J. S. & I.W.A. in Atlantic City in March—I say we, meaning Ralph B. Carter III of Hackensack, Walter Leach of Havens and Emerson in N.Y.C., Henry Van der Vliet of Maywood and L. W. Stieger, Supt. of the Maywood Chemical Co.—It was Stieger who told of a cartoon he had seen that morning of several workmen sitting down to eat from their lunch pails; the legend underneath said simply, "Shall we start talking about women immediately or just drift into it?"

* * *

DAFFY DEFINITIONS—Many of you know that I collect daffy definitions as one of my hobbies. Here's one from the Journal of the Maine Water Utilities Assn., to wit: "An Engineer is a person who passes as an exacting expert on the basis of being able to turn out, with prolific fortitude, infinite strings of incomprehensible formulae calculated with micromatic precision from vague as-

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Tapping Sleeves and Valves	Mud Valves
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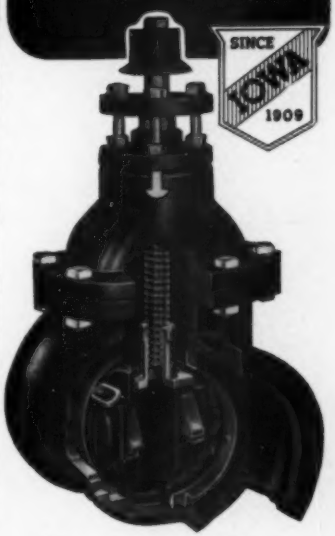
Sheer Gates	Valve Accessories



We manufacture complete equipment for water and sewage flow control in Filtration Plants, Sewage Disposal Plants and Pumping Stations. Specify Iowa and let us solve your problems.

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sumptions, which are based on debatable figures taken from inconclusive experiments carried out with instruments of problematical accuracy by persons of doubtful reliability and questionable mentality for the avowed purpose of annoying and confounding a hopeless chimerical group of fanatics referred to, all too frequently, as Engineers."

* * *

I found this among my notes on the trip back from the famous Joint Meeting of the AWWA and FS&IWA in San Francisco in July 1947. —"Slept through the famous 'Williams Loop' where the railroad makes a complete circle of 0.9 mile in circumference in order to maintain the ruling grade of one per cent.—Was wide awake, however, as we made 'Arnold's Loop' where the train runs nearly six miles in order to move eastward about half a mile. When you see this mountain railroading, one can understand why things shipped to the west coast, cost more."

* * *

SOWHESS—From the Digester of the Illinois State Health Dept., I learned that SOWHESS certificates were presented to Clarence Hill, Dixon, Harold U. Hill, and C. E. Magill of Carbondale. All three earned their certificates in the worst way, dunking in cold weather. "SOWHESS has been in existence for a number of years, but certificates are of recent origin." These were presented at the annual Sewage Operators Conference in Springfield, Ill.

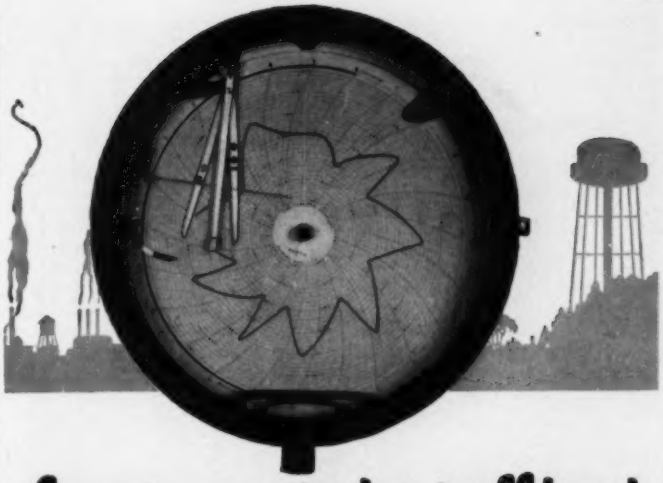
Oh Yes! SOWHESS;—"Sewage Operators Who Have Experienced Submergence in Sewage."—And do you remember Morris Cohn's famous dissertation on the subject.

* * *

L. L. Larson (brother of C.C., the Swede) Asst. Supt., Ft. Wayne, Ind. wrote recently noting that I had occasionally made mention of one Don E. Bloodgood, Prof. of San. Engr. at Purdue Univ. Luther enclosed the back page of *"Shell Progress,"* the Shell Oil Co. House Organ. Said back page had a cartoon comic strip called the "Bloko Boys" drawn by one Don Bloodgood—Surely there can't be two guys with that name—or can there?

* * *

And now about EARNEST BOYCE—Earnest who, is not only Head of Civil Engineering at the University of Michigan, but also is Vice President of the Federation (FS&IWA to you) is rather particular about the spelling of his name. You will note



Can you control cut-off level as close as this?

With Foxboro Recording Rotax Control of water tower altitude, level is automatically and consistently held within limits impossible with pressure switches. A typical municipal installation, for example, employs a tank 30 feet deep, 150 feet above the pump station. With an instrument chart range of 120 feet to 150 feet, the Foxboro Rotax Controller holds the cut-off level to within 6" at all times!

Foxboro Recording Rotax Controllers are set directly to desired cut-off and start-up points, without fussing around or having to measure levels in the tower. Both settings are always readily adjustable by the operator. There's no need for wiring between tower and station because all measurements are made at the pump. And the chart records are constant proof that proper levels were maintained during fires or other emergencies.

Write for Bulletin 184-6 for further information on this simple, more accurate and dependable control for your tower level. The Foxboro Company, 2288 Neponset Ave., Foxboro, Mass., U.S.A.

This exclusive Rotax assembly assures positive, unfailing pump operation. Its proven design overcomes disadvantages of ordinary electric controls. Maintenance is virtually eliminated.

FOXBORO RECORDING · CONTROLLING · INDICATING INSTRUMENTS

that as he spells it, there is an "a" in it. Here's why—

Earnest was a year old before he had a first name at all. Even then, he was a very earnest person—too earnest, his father said just to be Ernest, so Earnest it was.—He still is!

* * *

And of course with the above cut must go the story of a note from Clinton (Cons. Engr.) Bogert who wrote me as follows: "How many jobs does Pete Wisely hold down?" —In a recent Lippincott book, "Water or Your Life" by Arthur Carhart, whom the cover blurbs, received a B.S. in landscape architecture and city planning, we learn on page 263 that "Pete" is "secretary-editor of the Federated Sewer Workers Assn."

* * *

Jimmy Walker, the "*Transite*" Pipe man once read a scientific fact on how much water there is in a man of 140 lbs. and wrote me that he and Hugh Dewey (Buffalo, N.Y.) had about three times the amount of water purification to handle as I do. Understand that Jim is reducing, now.

* * *

Speaking of errors in books, as I was a moment ago—How many of you read Kenneth Roberts book "Henry Gross and His Dowsing Rod"?—Or did you read the rather critical review of it, which appeared in Eric Johnson's column "Percolation and Runoff" in the AWWA Journal? Now comes Tom Riddick, N.Y. City Consulting Engineer and Chemist, with an article in the July issue of Harper's, under the title of "Dowsing Is Nonsense"—And believe me, what Tom says is not nonsense.—"Rick" Johnson tells me that there is also to be another article in Harpers on "Dowsing is Not Nonsense"—After Riddick's coldly logical, and scientific destruction of Kenneth Robert's unscientific claims, I wonder what authority would claim otherwise.

* * *

KIT'S KARICATURES

* * *

I see by the *Atlanta Constitution* that Howard Bullard of that city, saved the city water department many dollars and a lot of work by using 75 cents worth of dry ice to freeze a pipe so that it could be repaired without digging it up.—Wonder if he got the idea from the article in *Water & Sewage Works* by John Ford, of the Ford Meter Box Co., in Wabash, Ind.—Oh yes, the newspaper said that "Bullard's operation drew commendation from Paul Weir, Waterworks Manager and Roy Ruggles, Waterworks Superintendent." —They spell water works as one word down that way.

* * *

Incidental Intelligence—"American teeth are decaying six times as fast as the dentists of the country can repair them"—You see—if fluoridation comes into general practice and only reduces dental caries by say 60 per cent, there will still be at least 2.4 times as many decayed teeth as

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For service in temperature ranges from 32° to 120° F.

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the dentists can care for, so it looks as though they'll still be able to earn a living.

* * *

"Bert" Berry, current AWWA prexy wondered out loud where the secretaries of the various AWWA secretaries are recruited.—And he answered the question this way—13 from state health departments, 9 from water departments, five from the peddlers, one each from university, consulting engineers, and the U.S. Government.

* * *

See you next month—

V.T.Y.-Doc.

Egmont Smith Scholarship Fund Report

At the mid-year board meeting of the Southwest Section, AWWA, Mr. J. R. Pierce, Pine Bluff, immediate past President and Trustee of the Egmont S. Smith Scholarship Fund, announced that the Trustees would very likely make two awards this year, as previously authorized by the officers of the Section and the Board directed that $600.00 from the Southwest Water Works Journal Fund be transferred to the Scholarship Fund for this purpose, and also authorized the Section to pay the expenses of both awardees to attend the Fort Worth meeting.

Water Supply and Treatment—7th Ed.

"Water Supply and Treatment," by the late Chas. P. Hoover, and published by the National Lime Assn., has been issued in its 7th edition. The latest edition of 211 pages is published in cloth binding.

First published in 1934, and since distributed via six editions to more than 50,000 persons, the latest edition containing 99 illustrations contains a number of important revisions covering disposal and reclamation of lime sludge, the versenate method of determining water hardness, polystyrene base exchange, methods of recarbonating softened water.

This edition represents the last work by Mr. Hoover, internationally

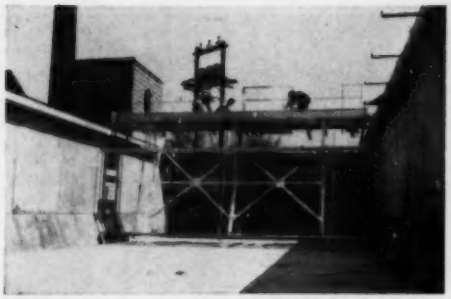
For
WATER, SEWAGE
or
WASTE
treatment
HARDINGE
Double-Acting
RECTANGULAR CLARIFIERS

Traveling mechanism removes *sludge* in one direction, *scum* in either direction

In sewage or water treatment plants where space is limited, or where sludge delivery is desired at one end of the tank, the Hardinge Rectangular Clarifier provides a compact, efficient unit.

A traveling bridge crane spans the tank and supports a sludge scraper. This mechanism moves automatically along the tank, scraping all settled solids into sludge hoppers at one end. Skimmers are also available to remove floating impurities from the water's surface.

Write for Bulletin 35-C-15 and Give Us Details of Your Treatment Problem



WATER SUPPLY—One of two Hardinge 30' x 100' Clarifiers in a Canadian Municipal water plant. Note sludge scraper and scum skimmer.

WASTE WATER—Eleven Hardinge 19.4' x 50.7' Clarifiers removing floating oil and sludge from oil refinery water. Flow: 80,000 G.P.M. of influent.

SEWAGE—Two Hardinge 24' x 88' Rectangular Clarifiers skimming and collecting sludge from sewage water.

WASTE WATER—Largest rectangular clarifier ever built. Mechanism is 78'9" long. Tank is 80' x 255'. Four of these units, plus one 28' x 130' unit are processing oil waste in a refinery.

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known water treatment consultant and authority, who died a month later. The fact that Mr. Hoover had been ill for some time probably accounts for the fact that further needed revisions were not made. For example, there are no bibliography references later than 1944. Many of the illustrations are the same as in several previous editions and have not kept pace with new developments in equipment. Terminology in reference to chlorination, predates that established in the 9th ed. of Standard Methods and the AWWA Manual of Water Quality and Treatment. Illustrations of the principles of operation of chlorine feeding equipment do not include Builders-Providence Inc. "Chlorinizer." References to chlorine dioxide refer only to a 1944 article, and there is no reference to the practice of fluoridation, only comment on the removal of fluorides. In the chapter on methods of water analysis, the reference is to the 8th edition of Standard Methods for the Examination of Water and Sewage, although the 9th edition was published in 1946.

In spite of these shortcomings of the 7th edition, "Water Supply and Treatment" remains as a monument to the late Charles P. Hoover. Copies of this book may be obtained from the National Lime Assn., Washington 5, D.C., at $1.25 per copy, plus 12c postage.

HOW
TO BUY A VALVE
When you buy a valve, you buy pipe-line control—which encompasses valve design, construction, operation, first cost and maintenance. Purchase-price alone is not the determining factor. Price is relative. A high quality valve having longer life and giving better pipe-line control always is lowest in final cost.
M & H VALVE
AND FITTINGS COMPANY
ANNISTON, ALABAMA
DEPENDABLE SERVICE—
YEAR AFTER YEAR!
Field reports establish the fact that M & H Valves are correctly designed, dependable in operation, with a record of long life and freedom from repair. Engineers recommend M & H Valves on basis of low cost per year of service. Sizes 2 to 30 inch, inclusive, with all standard end connections, including Mechanical Joint.
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Cal. Tech. Studies Water Quality Standards

A project to consolidate all available information on water-quality standards as an aid to water pollution control agencies is under way at the California Institute of Technology.

The work, involving a critical evaluation of thousands of references, is being done under contract with the California State Water Pollution Control Board. The survey has a two-fold purpose: to make the data on water-quality requirements for all beneficial water uses readily available to the state and nine regional boards, and to indicate where more research is needed.

Work of original investigators will be covered in addition to interpretation of water-quality standards in legislation, regulations, and court rulings. The project will include study and interpretation of:

(a) Water-quality standards or requirements recommended by the original investigators and researchers;

(b) The range of water-quality standards (upper and lower limits) which would be permissible for varying field conditions and beneficial water uses, again as recommended by the original investigators;

(c) Instances where the standards recommended by the original investigators have been embodied in and applied through ordinances, legislation, and rules and regulations of governing bodies and water pollution control agencies;

(d) Court rulings and decisions which have passed upon the reasonableness or unreasonableness of water-quality standards as established by public agencies;

(e) Bibliography of reference material;

(f) Findings, conclusions, and recommendations on water-quality standards and on additional research necessary.

Dr. Jack E. McKee, Associate Professor of Sanitary Engineering, is directing the project for the Institute. He is being assisted by Richard H. Gilman, Project Engineer, an Institute graduate.

News From Ohio

A number of changes in water works management and superintendents have occurred in the past several months. Some of them may not be news to Ohioans, in particular, but others around the country may not have heard what has been happening in the Buckeye State.

At Cleveland, where a new filter plant is due for completion about Dec. 1, John Marsh, who has been Chief Chemist of the Baldwin Filter plant

for 20 years, has succeeded to the position of Superintendent of Filtration. Al Gavlak is Supt. of Filtration at the Division Ave. plant.

At Columbus, Ohio, Paul Laux, formerly of Marion, Ind., and well known for the "Laux Test" for residual free chlorine, has been made Superintendent of the Water Dept., filling the position vacated by the death of Clarence Hoover. Marshall Houghn has succeeded to the position of Supt. of Filtration at Columbus to fill the place of the late Charlie Hoover.

Wm. Van Arnum, Chem. Engr. of the Mahoning Valley Water Dist. at Youngstown has retired and Merrill Riehl, Chief Chem. of the Ohio State Health Dept. Laboratories has gone to Youngstown to succeed Van Arnum.

Pennsylvania Has Color Films on Pollution

With the threat of water pollution becoming a major cause for concern in postwar Pennsylvania, the Commonwealth's Sanitary Water Board has prepared a double-barrelled film program to carry the story directly to the general public.

The motion pictures are being distributed simultaneously—"Dangerous Waters," a 35mm Ansco Color version for the theaters, and "Waters of the Commonwealth," a 16mm Kodachrome Commercial for schools, churches, clubs and similar groups. The theatrical film is a ten-minute one-reeler and the nontheatrical runs 25 minutes, including as it does, more complete coverage and technical data on each phase of the subject.

These motion pictures, which were produced by the Jam Handy organization in Detroit, involved both studio sets and extensive filming on location. Two cameras were used—one shooting 35mm and one 16mm—for each scene. Both films are narrated and scored with appropriate musical backgrounds.

These films are a part of the State of Pennsylvania's attack on the problem of pollution abatement. Known as the "clean streams" program, it went into high gear in 1945. The program is being conducted by the Sanitary Water Board of the State Department of Health.

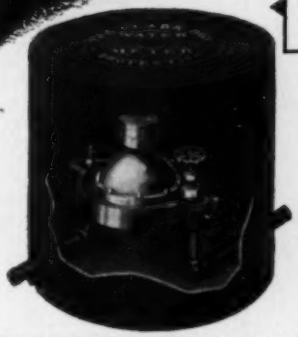
Excerpts from Purdue's Sanitary Engineering News*

In the United States 289 cities annexed so-called fringe areas during 1949.

*Edited by Prof. Don E. Bloodgood.

CLARK METER BOXES AND COVERS

Left, No. 16 Clark Wonder Lock Meter Box Round....16" and 18" diameters. Large 13" lid.



Above, No. 11 Oval Clark Wonder Lock Meter Box, especially for warmer climates. H-11", L-18", W-12".

Below, A-2-13 Clark Meter Box Cover with screw lock. Height 4", lid opening 13".

Above, A-2-11 Clark Single Lid Meter Box Cover, 4" throat. Also available in 6" and 9" throat.

Below, B-2-11-L Clark Double Lid Meter Box Cover, 6" throat. Also available in 4" and 9" throat.

Above, AA-3-12 Clark Meter Box Cover with 13" Wonder Lock Lid, for use with 15" (illustrated), 18" and 20" box body.

Improved Screw Lock with strong forged bronze bolt.

Wonder Lock Lid (bottom view) showing forged bronze bars.

Perfect Lock of one-piece manganese bronze forging.

write

H. W. CLARK CO.

MATTOON, ILLINOIS

Can anyone tell me why the study in Minnesota on the nitrates in well water brought out that the greatest concentration of difficulty is to be found in the southwest corner of the state.

It is interesting to note that production of oil from the oil shales of Colorado, Utah and Wyoming will be limited, not by the magnitude of the reserves, but by the water available in the area for plant and community use.

Primary treatment of sewage in Toledo results in 49% suspended solids removal and a 32% B.O.D. removal.

From *The Chemist*, by Dr. Roger Adams, "There is nothing more important to a man than to select for his life's work some line with which he is entirely happy because then, regardless of his ability and final attainments, he is likely to advance further than otherwise. Contentment with one's vocational activities is a foundation that enables a man to build upon it a superstructure that may tower above original expectations. Enjoyment in daily work should be the main pleasure in life, and ninety per cent of a man's compensation. This is the most important factor in the future happiness and success of an individual."

1.
WHAT ?? WENT WESTWARD ?
2.
WHAT ?? ARE ALARM CLOCKS ON FARMS ?
3.
WHAT ?? SAILED THE SEVEN SEAS ?
4. WHERE CAN YOU GET RELIABLE EQUIPMENT FOR FLUORIDATION?
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If yours is one of the pioneer cities planning a fluoridation program, it will pay you to come to %Proportioneers% for your equipment. Already we have had almost six years' experience in this revolutionary phase of water treating. Whether you want a simple chemical feeder, or a complete installation with accessories for automatic proportional fluoridation, you're sure and you're safe if it's %Proportioneers%. Mail coupon or write for data and recommendations.
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4. % PROPORTIONEERS, INC. %

Manufacturers & Equipment News

Materials Handling Loader

801

Tractomotive Corp., Deerfield, Ill., is now manufacturing a new wheel tractor loader featuring a hydraulic torque converter drive and an entirely new design clutch-type transmission. It is called the TL-10 Tracto-Loader.

The single stage torque converter furnishes a smooth, constant flow of power to the drive wheels. There is practically no spinning of wheels while loading, and crowding action is definitely improved, according to the manufacturer.

The TL-10 is mounted on rubber tires, has a ¾ cu. yd., hydraulically controlled bucket, weighs 10,650 lbs., and has a selection of four forward and four reverse speed ranges. There is ample bucket clearance and reach to load average size dump trucks.

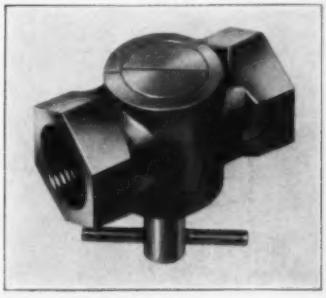
Keyes Joins Infilco

Infilco Inc., Chicago, Ill., has announced that Harmon E. Keyes, chemical and metallurgical engineer formerly of Phoenix, Ariz., has joined

If interested in equipment or literature mentioned above, mail a Reader Service Card with your name, address, and item key number.

the technical staff of the company as a special consultant. Mr. Keyes will devote himself primarily to the further development of the autoxidation process, a field in which he holds many patents.

For several years Mr. Keyes was engaged in electrolytic work, but 26 years ago he became active in the research and development of copper extraction processes, particularly production of ferric sulphate and sulphuric acid on a commercial scale. Later, he expanded his activities to include sewage, water pickle liquor and alkaline soil treatment applications of sulphur dioxide fixation by autoxidation.



Flow-Regulating Valve

802

Reynolds Shaffer Co., Detroit, Mich., has announced the new and different Reynolds Flow-Regulating Valve, which is a deluxe stop cock for use where an exact setting of the regulated flow of water, or other liquids, is required.

According to the manufacturer, the Reynolds Flow-Regulating Valve is positively guaranteed (due to "O Ring" packing) not to leak externally. Exceptionally close fitting (Bearenized finish of plug and I.D. of plug hole) permits only the slightest internal weeping. In spite of this extremely close fit the plug turns easily for accurate manual adjustment. No tools are needed.

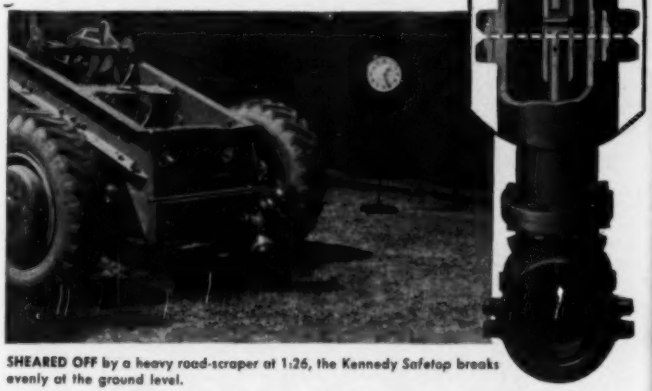
The present specifications are ¾ inch pipe size—2½ inch long in two different types. The R-V 1 is full ported with area of 1 inch pipe in port and the R-V 2 has ½ inch port for fine adjustments. The company states that the valve will be produced in larger sizes for special applications if desired.

Brooks Boiler Treatment Changes Name

Brooks Chemicals, Inc., Cleveland, Ohio, is the new name of the former Brooks Boiler Treatment Co., whose plants are located in Cleveland, Ohio

From Break to Service *in 11 minutes...*

THE KENNEDY SAFETOP is the only hydrant with the threaded breaking ring that gives positive connection and rigid alignment of the two standpipe sections. Extensive tests and actual service reports show that the Kennedy *Safetop* can stand as tough a blow as the conventional hydrant without damage. But under a smashing impact, it always breaks cleanly at the breaking ring, without damage to working parts.



SHEARED OFF by a heavy road-scraper at 1:26, the Kennedy *Safetop* breaks evenly at the ground level.

Photos taken at N. Y. State Section meeting, A.W.W.A., April 1949.

WITH ONLY an inexpensive *Safetop* Repair Kit and a few common tools, one man can permanently repair the Kennedy *Safetop*.

NO NEED FOR DIGGING because breakage is all above ground . . . no flooding because compression-type valve closes with water pressure.

IN JUST 11 MINUTES the Kennedy *Safetop* is back in service . . . working as smoothly and efficiently as if nothing had happened.

THE COMPLETE KENNEDY LINE includes a wide range of A.W.W.A. valves and fire hydrants. When you standardize your community on KENNEDY, you are assured of the same high quality and dependability that have characterized all products of KENNEDY for 74 years.

WRITE FOR SAFETOP BULLETIN 105

THE **KENNEDY**

Est. 1877

VALVE MFG. CO. • ELMIRA, N.Y.

VALVES • PIPE FITTINGS • FIRE HYDRANTS

and Hamilton, Ontario. The change was made at the annual meeting of the company during which Mr. Dan J. Wilkison of Cleveland was elected president.

The reason for renaming the company was given by Mr. Wilkison in the following statement: "Our company was originally a division of the Brooks Oil Company. For many years, our efforts were concerned almost entirely with the compounding of materials for boiler treatment. Gradually, however, the scope of our activities broadened to include the field of water problems generally, odor control treatments for refuse and disposal plants, the treatment of fuel oils, and the controlling of slag and fire scale deposits. We believe that our new name, Brooks Chemicals, Inc., is more indicative of this broader field."

Vertical Sump Pumps

803

The Deming Company, Salem, Ohio, has announced a new line of vertical sump pumps with modern features of design and construction.

Four basic units, 4610, 4620, 4630 and 4640, are made in a range of sizes from 1 to 10 inch discharge with capacities from 10 to 3000 G.P.M. and heads—up to 140 feet.

The pumps are regularly equipped with standard fluid ends but can be furnished with fluid ends for handling sewage in the 2, 3, and 4 inch discharge sizes.

Electric motors from ½ to 75 hp are furnished with the pumps or they can be supplied for either steam or turbine drive. Motor mounting is regularly designed for standard NEMA type "C" flange but the pumps can be furnished with adapter flange for other types of motor mounting brackets at extra cost.

Noteworthy features include heavy-duty construction, close tolerance dowel-ring fits from motor to impeller, and the positive alignment of all rotating and guide bearing parts. Column pipe connections are flanged and bolted for easy maintenance.

FOR TREATMENT OF SEWAGE and INDUSTRIAL WASTES

Specify SOLVAY

TRADE-MARK REG. U. S. PAT. OFF.

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SOLVAY Technical Service is available to assist you with any problems involving the treatment of sewage and industrial wastes. Also available on request are the following Solvay Technical and Engineering Bulletins. Write for your copies today.

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Ammonium Bicarbonate · Ammonium Chloride

James P. Stewart

Chas. A. Jurgensen

W. A. Neumann, Jr.

H. G. Bauer

De Laval Announces Executive Promotions

The following executive promotions have been announced by the Board of Directors of the De Laval Steam Turbine Co., Trenton, N.J.

Mr. James P. Stewart, previously Exec. Vice Pres., has been elected President.

Mr. Wencel A. Neumann, Jr., has been elected Vice President of Industrial Sales and will be responsible for the sales of De Laval steam turbines, pumps, blowers and compressors, IMO rotary pumps and power transmission equipment.

Mr. H. G. Bauer has been elected Vice President of Engineering and will also continue as Manager of Marine Sales.

Mr. Charles A. Jurgensen has been elected Vice President of Manufac-

If interested in equipment or literature mentioned above, mail a Reader Service Card with your name, address, and item key number.

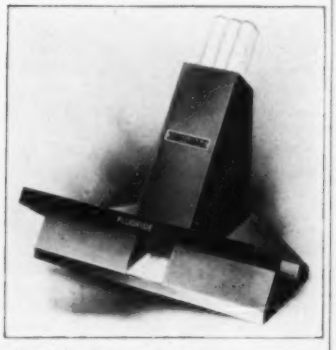
turing. He will continue to serve as Works Manager.

Mr. Stewart came with the company in 1946 after seventeen years capital goods experience in engineering, production, sales and executive positions. A mechanical engineering graduate of Cornell University, he is a member of several professional engineering societies. At present he is also President of the Hydraulic Institute, a trade association of the pump manufacturing industry.

Mr. Neumann, the new Vice President of Industrial Sales, has been associated with De Laval since 1946. Previously he was with Westinghouse Electric Corp. and also served as an officer in the U.S. Army Ordnance. He is an engineering graduate of the University of Michigan.

Mr. Bauer joined the organization in 1937. He received his technical education in Europe. Since 1948 he has served as Executive Engineer and was elected Vice President in 1949. He is a member of a number of professional engineering societies and industrial and trade associations in which he is actively serving on various committees.

Mr. Jurgensen joined the company in 1931. Since 1948 he has been Works Manager of the company. A member of several professional engineering and trade associations, he is Vice President of the National Foundry Association and a member of the National Castings Council.



Fluoride Comparator

804

W. A. Taylor & Co., Baltimore, Md., has available an inexpensive, accurate and easy to operate unit for control of fluoride dosage in municipal water supplies.

The Taylor procedure is a modification of the La Mar method which has been adapted to the Taylor Water Analyzer. The determination is made by adding a single reagent

SIMPLEX TYPE HF WEIR METER

IT'S SIMPLEX
IT'S ACCURATE

The Simplex Type HF water float operated meter is ingeniously adaptable to measuring liquid flows across weirs.

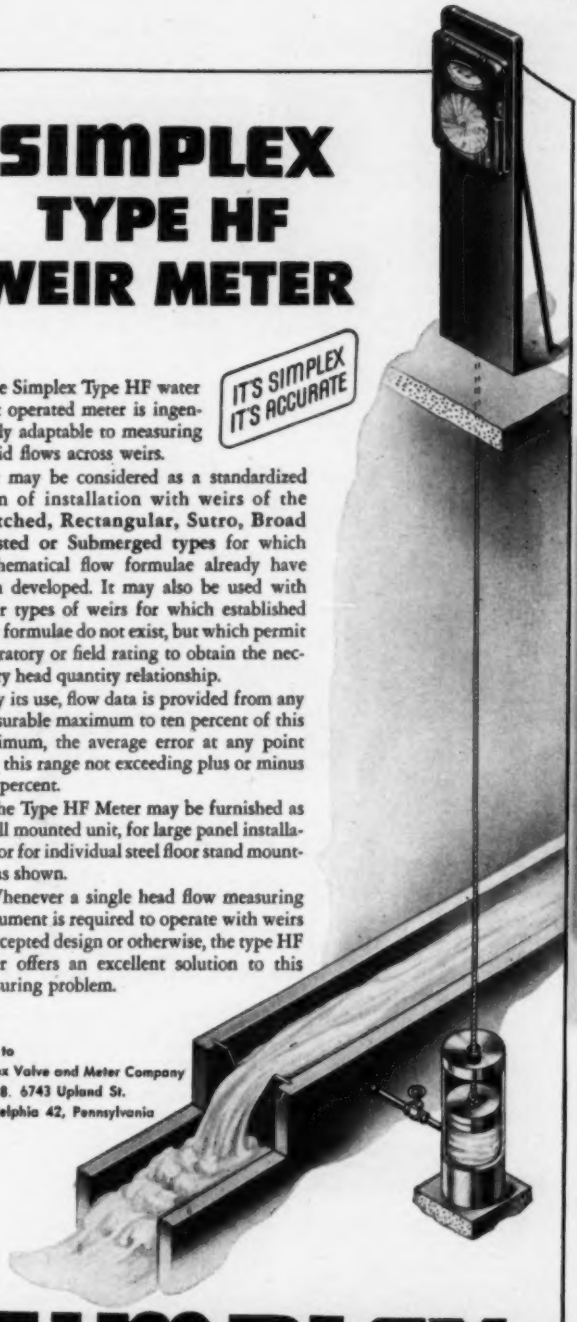
It may be considered as a standardized form of installation with weirs of the **Notched, Rectangular, Sutro, Broad Crested or Submerged types** for which mathematical flow formulae already have been developed. It may also be used with other types of weirs for which established flow formulae do not exist, but which permit laboratory or field rating to obtain the necessary head quantity relationship.

By its use, flow data is provided from any measurable maximum to ten percent of this maximum, the average error at any point over this range not exceeding plus or minus two percent.

The Type HF Meter may be furnished as a wall mounted unit, for large panel installation or for individual steel floor stand mounting as shown.

Whenever a single head flow measuring instrument is required to operate with weirs of accepted design or otherwise, the type HF meter offers an excellent solution to this measuring problem.

Write to
Simplex Valve and Meter Company
Dept. B. 6743 Upland St.
Philadelphia 42, Pennsylvania



SIMPLEX
VALVE AND METER COMPANY

to the water to be tested and comparing the resulting colored solution with a set of liquid standards which are permanently mounted in a plastic slide. These color standards, like all Taylor color standards, carry an unlimited guarantee against fading.

Taylor fluoride reagent is more stable, gives a broader color range and is less subject to interference by other ions than any other reagent now in use. This is another color comparator unit for use with the famous Taylor Slide Comparator for practically all determinations required by water purification plants, including pH, chlorine, total iron, color, nitrate, nitrite, etc.

Link-Belt Appoints Suman

Link-Belt Co., Chicago, Ill., announces that Robert W. Suman has been appointed chief engineer of the company's Philadelphia plant. He has been chief engineer for power transmission products since 1946 and is now assuming the added responsibility of materials handling equipment engineering.

Mr. William S. Campbell, who has been chief engineer at Philadelphia for materials handling and applied engineering products, has retired from active duty.

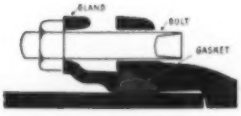
Mr. Suman entered the employ of the Link-Belt Caldwell plant in Chicago in 1934 upon graduation from Armour Institute of Technology and was assistant chief engineer at this plant prior to his transfer to Philadelphia in 1946.

PIPE LAYER'S

MAGIC WAND!

RATCHET WRENCH IS ONLY TOOL NEEDED TO LAY McWANE BOLTITE MECHANICAL JOINT PIPE

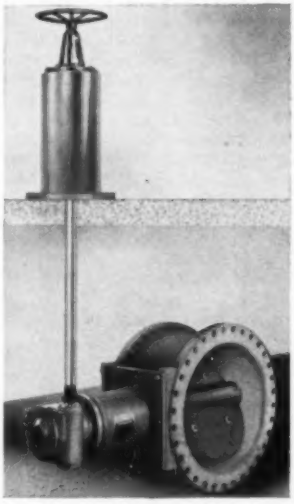
There's magic in a ratchet wrench when you lay McWane "Boltite" Mechanical Joint Cast Iron Pipe. A ratchet wrench is the only tool needed for one man to make "Boltite" joints. He simply slips the follower-ring and the gasket over the spigot end, then sockets the pipe, inserts the gasket into the stuffing box and bolts up the follower-ring for a bottle-tight, flexible joint. McWane Boltite pipe is furnished in sizes 2-inch through 12-inch, in 18-foot lengths. The follower-ring, gasket and bolts are interchangeable with any make of standard mechanical joint pipe. For further details, write McWANE CAST IRON PIPE COMPANY, BIRMINGHAM 2, ALABAMA.



Boltite pipe is used for water, gas, steam, oil, chemicals and other liquids. Gaskets are rubber compound, asbestos, duck tipped, and other materials for special services.

McWANE CAST IRON PIPE

Lasts for Centuries



Manual Control Valve Features Babbitt Seat

805

R-S Products Corp., Philadelphia, Pa., has announced a new heavy-duty valve of the butterfly type (No. 788) that is equipped with totally enclosed gear reduction drive, extended shaft and floor stand. The sealing of water pressure is obtained by utilizing a babbitted seat in the body and Monel or stainless steel welded to the periphery of the valve disc. Such metal-to-metal seat gives satisfactory commercial shut-off in most installations.

It is claimed that with a 350 foot head of ambient water, a 36-inch valve with a babbitted seat has a leakage of only 50 ghp. Remote, automatic or semi-automatic controls are also available for this type of valve.

Byron Jackson Makes Colville Adv. Mgr.

Byron Jackson Co., Los Angeles, Calif., has assigned the management

If interested in equipment or literature mentioned above, mail a Reader Service Card with your name, address, and item key number.

of all advertising and sales promotional activities for the company to Theodore R. Colville.

Mr. Colville has been with Byron Jackson Co., for nearly two years, becoming affiliated with the company in June, 1948, and has been advertising manager for the Pump Division up to the present time. He was previously associated with the General Electric Co., in Schenectady, N.Y., engaged in the advertising activities of that organization.

L. Booth To Represent Hardinge in Salt Lake City

Lionel E. Booth is now associated with Hardinge Company, Inc. and—according to an announcement by Harlowe Hardinge, company president—will direct the activities of its Salt Lake City office, now being re-established. Independently of his work for Hardinge, Mr. Booth will continue his former engineering activities and the sale of the Booth flotation machine.

Mr. Booth's offices are at 146 South West Temple St., Salt Lake City 1, Utah. This address will now also be designated as a Hardinge district office.

Hagan Corp. Offers Flow Signal Transmitter

806

Hagan Corporation, Pittsburgh, Pa., has announced the High Pressure Flow Signal Transmitter, a pneumatically operated flow differential measuring unit which transmits proportional signals to remote recording or indicating instruments, or to automatic control units.

Interchangeable measuring elements cover a continuous range of pressure differential from 5.5 inches water column to 100 psi., at static pressures up to 1500 psig.

The output loading pressure has a maximum valve of either 30 or 60 psig. and may be linear with differential or with flow. The pressure is carried to an indicator, recorder or to an automatic control system through a single ¼ inch pipe.

Accuracy of measurement is within one percent of full scale reading. A

SARAN LINED steel pipe

Cut "downtime" to a minimum! Saran lined steel pipe can be cut and threaded in the field as easily and quickly as ordinary steel pipe—involving NO costly delays with special tools or handling. And, once installed, saran lined steel pipe means dependable long term operation. In addition to excellent corrosion resistance, this remarkable pipe offers you the plus values of rigidity and pressure strength.

These advantages are of prime importance to you in the reduction of shut-down time and equipment replacement. INVESTIGATE saran lined steel pipe today! Mail this coupon for full information. *Saran lined steel pipe is manufactured by The Dow Chemical Company.*

Distributed by

Saran Lined Pipe Company

2415 BURDETTE AVE. • FERNDALE, MICHIGAN
With Offices In: New York • Boston • Philadelphia Pittsburgh • Chicago • Tulsa • Portland • Indianapolis San Francisco • Houston • Denver • Seattle • Los Angeles • Cleveland • Charleston, S. C. • Toronto

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Please send me your catalogue containing detailed information on Saran Lined Pipe, Valves and Fittings.

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COMPANY_____

ADDRESS_____

CITY_____

STATE_____

SP-93

SARAN LINED PIPE
a
DOW
product

change of only 0.1 percent in applied pressure differential will effect a reproducible change in loading pressure when sending maximum loading pressure.

Koppers West Coast Plant Starts Production

Koppers Company, Pittsburgh, Pa., has announced that the initial West Coast production of Bitumastic coal-tar pipe line enamels will get under way in the fall of 1951 at the new Fontana, Calif., plant of the company.

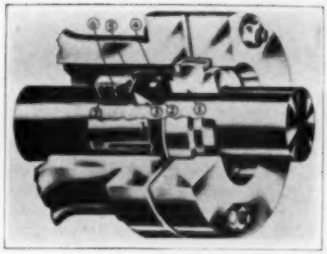
This new plant, according to Fred C. Foy, V.P. and General Manager of the Company's Tar Products Division, is located on a 158-acre site near the large Kaiser Steel Company works, and will be the first plant to produce coal-tar base pipe line enamels on the West Coast. Previously all of the coal-tar enamels had to be imported from eastern sources of production.

Production of Bitumastic Enamels at the Fontana plant will permit engineers to specify these coatings in the western states with assurance of an adequate supply of the materials.

Damaged—back in service quickly!
Mathews Modernized Hydrants are designed for service even under today's traffic hazards. When knocked over by an out-of-control vehicle their simple construction and removable barrel make them
easier to repair
easier to replace
MATHEWS
HYDRANTS
Made by R. D. Wood Company
Public Ledger Building, Independence Square
Philadelphia 5, Pa.
Manufacturers of "Sand-Spun" Pipe (centrifugally cast in sand molds) and R. D. Wood Gate Valves

Mathews Modernized Hydrants offer these advantages:

Stuffing box cast integral with nozzle section • Head turns 360° • Replaceable head • Nozzle sections easily changed • Nozzle levels easily raised or lowered without excavating • Protection case of "Sand-Spun" cast iron for strength, toughness, elasticity • Operating thread only part to be lubricated • All working parts contained in barrel—removable without excavating • A modern barrel makes an old Mathews good as new • Available with mechanical joint pipe connections



Improved Mechanical Seal

807

Crane Packing Company, Chicago, Ill., has announced a new, improved mechanical seal. The new seal, designated as the Type 9 Mechanical Shaft Seal, performs effectively under severe temperature and corrosive conditions, and incorporates a flexible ring molded from the new plastic, Teflon.

The construction of the seal is shown in the cut-away drawings: The set-screwed metal retainer (7) provides a positive drive from shaft to carbon sealing washer (2) through dents (4) which fit into washer notches. An effective seal between the shaft and washer is insured by the precision machined Teflon wedge ring (3) which is preloaded by the action of multiple springs (6). The lapped raised face of the rotating sealing washer (2) mates against the highly lapped face of the stationary seat (1) to provide a positive leakproof seal with minimum friction between the vertical faces.

Jeffrey Mfr. Co. Has New President

During the annual meeting of the Board of Directors, The Jeffrey Mfg. Co., Columbus, Ohio, elected its first new President in 21 years. J. H. Fulford, who joined the company in 1931 as Manager of the Pittsburgh District Office and who became a Vice President in 1944, was elected to head the company.

R. H. Jeffrey, eldest son of the Founder and formerly Chairman of the Board, was named Chairman of the Executive Committee. R. W. Gillispie, President since 1930, succeeded Mr. Jeffrey. He joined the company in 1926.

Miami Orders Worthington Engines, Pumps, Gears

The Southwest Water Treatment Plant of Miami, Florida, now under construction, has recently ordered four Diesel engine driven pumping units from Worthington Pump and Machinery Corp.

If interested in equipment or literature mentioned above, mail a Reader Service Card with your name, address, and item key number.

REPLACE troublesome VALVES With . . .

Old and troublesome valves . . . or too few valves in a distribution system . . . can be responsible for dangerous and costly slow-down or shut-down of water supply for every day use or, more serious, when badly needed in event of an emergency. Now is the time to make replacements and to install new valves where conditions show the need for so doing. The Eddy Valve, bronze mounted throughout, with mechanical joint connections (only a ratchet wrench needed) is best for easy installation . . . for easy operation . . . for long life trouble-free service.

Write today for prices and delivery date for valves needed to modernize your water distribution system.

EDDY
VALVE COMPANY
A Subsidiary of James B. Clow & Sons
WATERFORD, NEW YORK

Four 16-LCS-4 Worthington Horizontal Centrifugal pumps are to be driven by Worthington SDR-5 Diesel engines of 825 hp each, through Worthington J-6 speed increasing gears.

One of these engines is arranged so that it can be quickly disconnected from the pump and coupled to a 750 kva Electric Machinery Co. generator.

The plant will supply water for Miami at an initial capacity of 40 mgd with an eventual capacity of 80 mgd. The plant serves part of the area south of the Miami River and will be completed in 1954.

Nickel Clad Pipe & Fittings

808

Bart Manufacturing Corp., Belleville, N.J., has made available Lectro-Clad Pipe and Fittings for corrosion protection.

The Bart Lectro-Clad process is a patented process for depositing a predetermined thickness of nickel on the interior and/or exterior of pipe and fittings from 1½ to 20 inches I.P.S. Only 0.006 inches of nickel is necessary to protect against most corrosive action; however in extreme cases up to 0.015 inches or more can be applied. The bond is such that the nickel actually becomes an integral part of the steel.

The company states that the lining has been proven to be pore-free and can withstand severe tests such as heating, bending, welding and reducing without any effect to the bond or corrosive resistance of the nickel.

H. A. Ehlers Joins Neptune Meter

H. A. Ehlers, Superintendent of the Antigo Water and Sewerage Department at Antigo, Wis. resigned July 1, to act as Wisconsin representative of the Neptune Meter Co. He will be trained by Francis Cunningham, longtime Neptune representative in Wisconsin.

Roots-Connersville Expands Test Facilities

Investment of a million and a half dollars in a construction program covering new erection floor, expansion of present test facilities, manufacturing space, and machine tools by Roots-Connersville Blower Corp., Connersville, Ind., has been announced by John B. O'Connor, Executive Vice President of Dresser Industries, Inc., Dallas, Texas, and Mr. Robert Owens, President of

WHY BUY MARLOW PUMPS?

ONE IMPORTANT REASON IS—you eliminate many headaches when you standardize on one good line of pumps throughout your system.

Marlow makes the world's most complete line of plunger sludge pumps for sewage disposal works. In four sizes and two types. Any capacity required. There are more Marlow plunger sludge pumps in use than all other makes combined.

Marlow makes the world's most complete line of engine and electric motor driven self-priming centrifugal pumps. From small portables to units of 240,000 GPH capacity.

Marlow makes the world's most complete line of engine and electric motor driven diaphragm pumps. 2 and 3 inch lightweight, 3 and 4 inch single and 4 inch double, heavy duty.

Furthermore, Marlow has the largest pump distribution and service organization and Marlow distributors service what they sell.

For complete details see your Marlow distributor or write the factory.

MARLOW PUMPS

243 GREENWOOD AVENUE
RIDGEWOOD, NEW JERSEY

The Standard of the Industry

Roots-Connersville, one of ten Dresser operating companies.

These new facilities will enable Roots-Connersville to test the largest centrifugal blowers and compressors ever designed, which it is now building.

Flexible Ball Joints

809

Barco Manufacturing Co., Chicago, Ill., has made available the Barco Ball Joint, which, according to the company, is one of the most versatile fittings ever developed to provide flexibility in piping. Basically, it consists of a short pipe nipple terminating in an enlarged hemispherical section or ball which is housed inside an outer casing between two molded gaskets. This construction permits rotation as well as side flexing of the ball part in any direction up to 40°.

The joints are commonly used to overcome piping misalignment, to allow for settling or movement of piping, to guard against vibration or shock, to permit movement of loading or unloading lines, and for many other applications.

Barco manufactures 12 styles of the joint and fifteen different sizes from ¼ to 12 inches, and offers a choice of seven different service specifications and six different metals for handling temperatures from —50° to 1000°F., pressures from vacuum to as high as 750 p.s.i. steam or 6,000 p.s.i. hydraulic.

WARREN
Solves Your
PIPE
PROBLEMS
BELL & SPIGOT PIPE •
FLANGE PIPE •
MECHANICAL JOINT PIPE •
FLEXIBLE JOINT PIPE •
SPECIAL CASTINGS •
SHORT BODY BELL & SPIGOT SPECIALS •
Warren Cast Iron Pipe and Fittings can be supplied in all sizes 2" to 84" with all types of joints and in accordance with Standard Specifications. Specify "Warren Pipe" for your next job.
Take advantage of our large stock of non-standard patterns, when in need of special castings to meet your individual requirements.
Warren
FOUNDRY & PIPE CORP.
55 LIBERTY ST. — N. Y. C.
WARREN PIPE CO. of MASS. INC.
75 FEDERAL ST., Boston, Mass.

Ludlow Appoints Musser

Ludlow Valve Manufacturing Co., Inc., Troy, N.Y., has announced the appointment of Glenn W. Musser, well known in the industrial and jobbers trade throughout the Southwest, as Sales Representative of the company for that territory.

Mr. Musser has covered the Southwest territory for the past 30 years and after completing technical training at the Company's factory at Troy, N.Y., has made his headquarters t 2415 San Jacinto, Houston 4, Texas. Mr. Musser will represent Ludlow in the states of Texas, Louisiana and Oklahoma.

Hopwood Passes

John M. Hopwood, of Pittsburgh, Pa., chairman of the board of the Hagan Corporation and its subsidiaries, died Friday, June 8, at Vero Beach, Fla. He was 67.

Other companies of which Mr. Hopwood was head and co-founder were Hall Laboratories, Inc., Calgon, Inc., and the Buromin Co.

Son of a Welsh coal mine operator, he was educated in the classics, but early evidenced an interest in technical problems. He came to the United States in 1904, at 21 years of age.

Anti-Rust Paint

810

Paint Corporation of America, Cleveland, Ohio, has announced a new penetrating and sealing anti-rust

Deafening!

Admiring Wife: "I know you must have gotten lots of applause."

After Dinner Speaker: "Yes. It sounded like a caterpillar, wearing gum shoes, crawling over a Persian carpet."

If interested in equipment or literature mentioned above, mail a Reader Service Card with your name, address, and item key number.

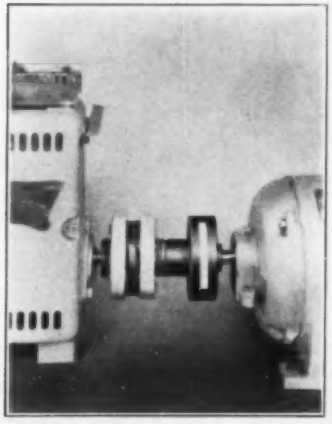
paint, PCA-100, which can be applied right over rusted surfaces.

Suitable for both interior and exterior use, the new paint is reputed to be equally effective in preventing rust on new metal or stopping rust action on present rusted metal. The manufacturer advises that PCA-100 can be applied right over rust without extensive surface preparation such as wire brushing, scraping or sand blasting. Upon application, it penetrates through the rust layer into the base metal and seals the surface against further rusting. The paint is suitable for either brush or spray application.

Crane Packing Co. New Plant

Construction of new general offices and plant facilities of the Crane Packing Company of Chicago is underway, it was announced by Frank E. Payne, company president.

The Crane Packing Company for over forty years has become one of the world's largest manufacturers of industrial packings, mechanical seals, oil seals and, more recently, the new "John Crane" Lapmaster, a precision lapping machine. The new plant site, situated on Oakton Avenue near Lehigh in Morton Grove, Illinois, will cover 133,000 square feet when completed.



Clutch Coupling

817

Automatic Steel Products, Inc., Mercury Clutch Division, Canton, Ohio, has brought out the Series "E" Mercury Clutch Coupling. This is a complete unit consisting of a Series "E" Mercury Clutch with provision for mounting a standard flexible coupling between it and the driven load.

Designed especially for installation on the shafts of integral horsepower electric motors up to 15 h.p. rating.

CEMENT GUN COMPANY RELINES SETTLING BASINS WITH GUNITE

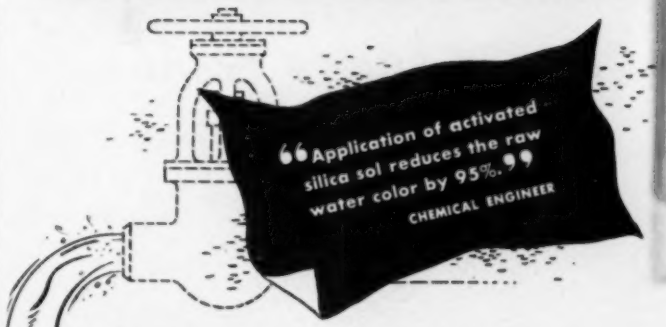
Photograph above shows three of four Settling Basins at a Virginia City's Municipal Water Works during the course of being relined with "Gunite." The concrete in this structure had disintegrated considerably, due to chemical and frost action.

Cement Gun Company crews replaced a "Gunite" lining on the floor and on the exterior walls of the basins and, in addition, grouted under the floor of all four basins to solidify the structure.

Additional reinforcing of steel mesh and "Gunite" was added at all corners where failure was indicated by leakage and the presence of large cracks.

This is just one of many typical "Gunite" repair jobs which have been done. For information on "your job" and description of many other "Gunite" jobs, performed by us, send details and request catalog (C) 2400—on your letterhead, please.

CEMENT GUN COMPANY
"GUNITE" CONTRACTORS
GENERAL OFFICES—ALLENTOWN, PENNA. U.S.A.
MANUFACTURERS OF THE CEMENT GUN



Now, water that formerly ranged from 150–400 ppm color is clear and sparkling. In addition, this plant uses N-Sol-A coagulant aid to increase its capacity from 2000 gallons per minute to 4000 gallons.

N-Sol-A produces a heavy, large, fast-settling floc which results in improved quality water, increased throughput capacity. Ask for free copy "Activated Silica Sols in Water Treatment."

N-Sol-A coagulant aid is prepared in your plant from our "N"* Silicate of Soda reacted with ammonium sulphate. Other N-Sol Processes use chlorine, alum, or sodium bicarbonate as reactants.

Reg. U. S. Pat. Off.

N-SOL PROCESSES FOR WATER COAGULATION

PHILADELPHIA QUARTZ COMPANY
Manufacturers of Soluble Silicates
1166 Public Ledger Bldg., Phila. 6, Pa.

If interested in equipment or literature mentioned above, mail a Reader Service Card with your name, address, and item key number.

The new unit used in conjunction with a flexible coupling provides a satisfactory connection between the motor shaft and the driven shaft without the necessity of maintaining exact alignment.

Wick Advanced by Rockwell

Rockwell Manufacturing Co., Pittsburgh, Pa., has announced the appointment of Paul A. Wick as Assistant to the President, according to a statement by W. F. Rockwell, Jr., President.

Mr. Wick is a graduate of the University of Dayton and the University of Pittsburgh Law School. During World War II, he worked on the legal staff of the Pittsburgh Army Ordnance District.

Joining the legal department of Rockwell in 1946, Wick became Assistant Secretary of the Company in 1948, the position he held until his present appointment.

Evans Heads Rochester Branch for Worthington

Worthington Pump & Machinery Corp., Harrison, N.J., has announced the appointment of L. M. Evans to head of the new Rochester, N.Y., branch office of the company which is located at 1246 Sibley Tower Building, Rochester 4, N.Y.

Mr. Evans received his B. S. Degree in electrical engineering from the Cooper Union Institute of Technology in New York City in 1936. He then took Worthington's Engineering Training Course at Buffalo. Subsequently he served the company as an assistant test engineer and general line estimator and representative in St. Louis, Buffalo, and Syracuse except for four years of military service with the Army Signal Corps from 1941 to 1945.

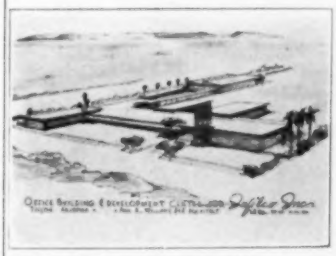
Synchronous-Motor Timer

812

General Control Co., Boston, Mass., has designed a new synchronous-motor timer for accurate control of a wide variety of times operations.

This type SY "Promatic" Timer can be used for all time periods between ½ second and 24 hours. It actuates five s.p.d.t. load contacts independent of the timer-control circuits. There are two separate solenoids—one operates the clutch and timing mechanism, and the other actuates the load contacts. The timer automatically resets for each new cycle.

Sturdily mounted in a cast frame, long life is assured through a unique "O" ring-drive assembly which eliminates gears. The pre-set interval and the elapsed time are both clearly visible on the 3⅛ inch diameter dial.

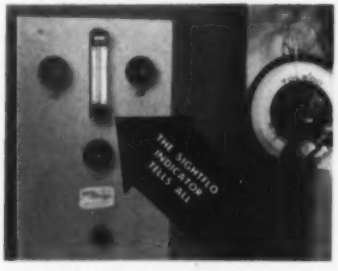


Infilco Starts Construction Of New Headquarters

Infilco Inc., Tuscon, Ariz., has let contracts for a new headquarters to house the executive, engineering, sales, and chemical laboratories divisions of the company. The building will occupy 7½ acres, comprise 36,000 square feet floor space, house over 200 employees and cost more than $400,000.

The one story structure will be built on a rigid steel frame with non-load bearing brick curtain walls. It has been especially designed for the Southwest with an umbrella roof to guard against direct sunlight. Most

(Continued on page 103A)



BUILDERS *Visible Flow* CHLORINIZER Model DVSX at Brewer, Maine

You don't have to do any crystal ball gazing when you use BUILDERS *Visible Flow* CHLORINIZERS. These modern chlorine gas feeders show you what's happening "plain as the nose on your face". If there's a flow of chlorine gas, the Sightflo indicator says so: if there's no flow it says *no!* This positive flow rate indicator shows the amount of feed, too — accurate within ± 4%. Here's but one of many reasons why hundreds and hundreds of users endorse Builders Chlorinizers.

Available in three volumetric models — for any chlorination service:

Up to 400 lbs./day	. . . Model DVSX	. . . Bulletin 840-F2A
Up to 2000 lbs./day	. . . Model CVS	. . . Bulletin 840-F1
Up to 6000 lbs./day	. . . Model HCVS	. . . Bulletin 840-G27

For Bulletins, address Builders-Providence, Inc. (Division of Builders Iron Foundry), 35' Harris Ave., Providence 1, R. I.

BUILDERS PROVIDENCE
Instruments

If interested in equipment or literature mentioned above, mail a Reader Service Card with your name, address, and item key number.

(Continued from page 102A)

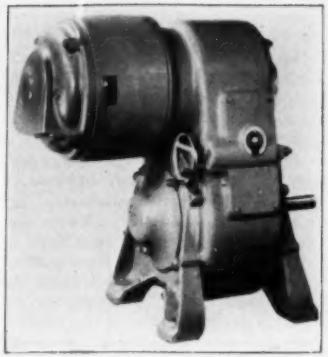
of the building has strip-type windows, running in a horizontal band above head level and sheltered by over-hanging eaves. The E shaped plant provides for 100% outside offices. The building is treated with accoustical tile, has a resilient floor covering and complete winter-summer air conditioning system.

Allis-Chalmers Scholarships

Five girls and five boys were named recipients of ten $500 Allis-Chalmers Manufacturing Co. scholarships given by the firm this year, it has been announced by W. A. Roberts, president.

Winners were chosen after the scholarship committee of educators and businessmen carefully examined the qualifications of the entries from sons and daughters of Allis-Chalmers employes.

Last year five winners were chosen but with the keen competition and enthusiasm exhibited, the number of scholarships awarded was doubled this year, according to the committee. High school seniors who are sons and daughters of one of Allis-Chalmers 30,000 employes were eligible for the awards. This is the second year the scholarships have been awarded.



Larger Variable Speed Drives

813

Sterling Electric Motors, Inc., Los Angeles, Calif., has added to its line new larger horsepower Speed-Trol Electric Power Drives. They are designed to meet the growing demand for variable speed drives of 20 and 25 horsepower ratings in the chemical, metal working, food and plastic industries. The unit illustrated is Sterling's Drip-Proof model which prevents liquids or any foreign material from falling into the motor. Motor housing and variable speed transmission case are made of rugged gray iron castings which provide utmost protection against corrosion from moisture-laden or chemical atmospheres. Outstanding features of this Sterling Speed-Trol are positive adjustment of pulleys, infinite speed variation and accurate control of speed under varying loads. The type KFE Speed-Trol shown here is the first of a series in the range of 20 to 25 horsepower.

Foxboro Expands Facilities

Foxboro Co., Foxboro, Mass., will have added 50,000 square feet to the working area at the company headquarters when the new one-story building is completed in the near future. The new building is so located as to be a connection, on the same floor level, between the present factory buildings and a new warehouse recently completed.

According to the company, the new building will be used principally for the final assembling and testing of recorders and controllers for temperature, pressure, liquid level, and flow; and the transfer of these operations from the older buildings to the new

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one will permit expansion of departments which produce electronic and electric instruments and control equipment of other descriptions.

In addition to the new assembly building and warehouse mentioned, a new Training School Building is being erected, adjacent to another group of the company's buildings across the street.

Macbeth Doubles Plant Facilities

Macbeth Corporation and subsidiaries, Newburgh, N.Y., manufacturers of pH meters, photometers, optical instruments and color matching lights, announce the acquisition of a second plant in Newburgh, N.Y. for the manufacture of optical and electronic instruments.

This represents a doubling of present manufacturing and research facilities and a fourfold increase in its plant size since the Macbeth Corporation moved to its present site from New York City early in 1950.

Tri-Clad Vertical Motors

814

General Electric, Schenectady, N.Y., has announced a line of new vertical, solid-shaft capacitor motors, featuring standardized mounting dimensions and quiet operation.

An addition to the company's Tri-Clad integral-horsepower, single-phase, capacitor motor line, the new motors are available in ratings from ¼ to 5 hp.

Tri-Clad construction provides the motors with protection from physical damage, electrical breakdown, and operating wear and tear. Dimensions of the Type P base, machined to NEMA standards, are the same as those of polyphase motors of the same size, permitting interchangeability without modification of the mounting. The capacitor motors with squirrel-cage rotors—no brushes or commutators—provide quiet operation without causing radio interference.

Insul-Mastic Appoints Bulmer

Insul-Mastic Corp. of America, Pittsburgh, Pa., has announced the appointment of George A. Bulmer as manager of the newly formed west coast branch of the company, located in Los Angeles, Calif.

Mr. Bulmer was formerly associated with the Marine Engineering and Supply Co. and is a trained civil engineer with years of experience in construction engineering work. In the past few years he has been specializing in the field of insulation.

A native of the west coast, Mr. Bulmer will cover the states of Oregon, Washington, Nevada, Utah, California, Arizona, New Mexico, Colorado, Wyoming, Idaho and Montana for Insul-Mastic.

Concrete Floor Surfacer

815

Flexrock Co., Philadelphia, Pa., has developed a new concrete hardener called Flintcrust Liquid, which converts a "naked" concrete floor into a floor capable of long and maintenance-free service under oil, grease and penetrating, discoloring, and disintegrating conditions as well as heavy abrasive truck traffic. FLINTCRUST transforms "bare" concrete, which ordinarily "drinks" oil, grease, and other disintegrating liquids, into a case hardened surface impervious to these destructive chemicals. It counteracts and prevents "sanding" and eventual "surface breakdown"; prevents "drag" of material handling equipment, thereby facilitating mobility of vehicles. FLINTCRUST is easily applied by flushing, without interrupting normal plant opera-

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MAINE...
"Flexible" Power Bucket Machine At Work In City Sewer Line. Sanford, Maine. Five Cubic Yards Of Rock And Sand Removed From One Line Alone!

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tion. With an approximate coverage of 7/8 gal. per 100 sq. ft., FLINT-CRUST is available in 6, 12, 18, 30 and 55 gallon containers.

American Wheelabrator Reorganizes Sales Department

In a move designed to meet the growing use of its products, American Wheelabrator & Equipment Corp., Mishawaka, Ind., has reorganized and expanded its sales staff at the executive level according to Otto A. Pfaff, President. The firm manufactures dust and fume control equipment for purifying the air in sewage treatment operations. They also manufacture Wheelabrator Airless Blast Cleaning equipment and other products for the foundry and metal working industries.

Foxboro Opens Knoxville Office

Foxboro Company, Foxboro, Mass., has opened a new branch office at 618 W. Church Avenue, Knoxville 16, Tennessee. Mr. Marvin L. Cleaton, Jr., formerly in charge of the company's office at Columbus, Ohio, has been transferred to become Branch Manager at Knoxville. Until now, manufacturers in the Knoxville area have been served by the Foxboro office in Atlanta.

Pipe Line Rock Shield

B15

Owens-Corning Fiberglas Corp., Toledo, Ohio, has announced a new product, Fiberglas pipe line rock shield, for use during pipe wrapping operations in rough terrain.

Rock shield protects pipe in rocky areas, at river crossings, in swamps, at railroad or road crossings and wherever pipe encounters rough handling.

Rock shield is a prefabricated cushioning material of high impace strength, made of bitumen blended with inorganic filler and reinforced with Fiberglas Coromat inner wrap.

It is applied by a two-man crew with pressure-sensitive tape or metal strap. Rock shield is made in roll or sheet form.

Rock shield is the third in the line of corrosion protection products manufactured by Owens-Corning. Others are parallel reinforced Coromat for inner wrap, and pipe line outer wrap. The three products provide reinforcement and corrosion-protection for pipe installed underground.

Rust Constructs Water Plant for J & L

Rust Engineering Co., Pittsburgh, Pa., is constructing a water treatment plant at the South Side works of Jones & Laughlin Steel Corp., to replace one which will be razed to make room for the new No. 4 Open Hearth Shop.

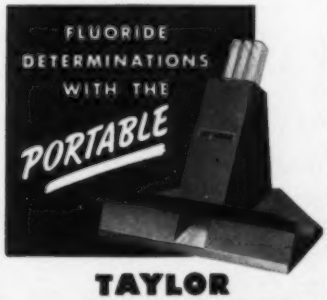
Located near the 30th Street Gate, the new water treatment plant will be capable of handling about 4,000 gallons of raw water per minute. It will cold process water drawn from the nearby Monongahela River for use throughout the Pittsburgh Works.

Slime Control

B17

Monsanto Chemical Co., St. Louis, Missouri, has available, in experimental quantities, a new product to control the formation of slime in industrial waters.

The product is Santophen 45, a technical grade of sodium trichlorophenate. Laboratory tests and field trials in large cooling water systems have shown it to be highly effective against bacteria and algae, common slime forming organisms, the company reports.



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In the past, chemicals such as chlorine, hypochlorites, copper sulfate and sodium pentachlorophenate have been used to control the formation of such deposits.

The trichlorophenls liberated by Santophen 45 are soluble in acid waters, and capable of maintaining the necessary activity against slime producing microorganisms while some control agents are not.

E. H. Bronstein Corrosion Consultant to Michigan Pipe Co.

The appointment of Emanuel H. Bronstein as Consulting Corrosion Engineer for Research and Sales Coordination has been announced by Henry Smith III, vice-president of the Michigan Pipe Company.

Bronstein, for the past nine years associated with the Ric-Will Co. of Barberton, Ohio, manufacturers of thermally insulated piping systems, resigned his position as Director of Development and Consulting Corrosion Engineer to join the Michigan Pip Co., Bay City, Michigan, manufacturers of "MPC" corrosion-resistant piping.

Cleveland Tapping Machine Makes Wise Asst. Genl. Mgr.

Cleveland Tapping Machine Co., Hartville, Ohio, has appointed A. R. Wise, Assistant General Manager. The Cleveland company is a subsidiary of Automatic Steel Products, Inc., Canton, Ohio. Mr. Wise has been associated with Cleveland Tapping for the past five years as Vice-president. He was formerly Chief Engr. & Genl. Supt. of Spun Steel Corp., also a subsidiary of Automatic Steel.

Literature & Catalogs

Corrugated Steel Sheeting

818

Armco Drainage & Metal Products, Inc., Middletown, Ohio, has just published a new, illustrated 10 page booklet on **Armco Steel Sheeting.** The booklet describes how to use lightweight corrugated steel sheeting to effectively control movement of soil or water and points out where Armco interlocking and flange type sheeting can be used to advantage.

Photographic case-histories show that corrugated sheeting has ample strength, is fast driving and results in lower costs. The booklet points out the fact that steel sheeting can be pulled and re-used many times.

Also included in the booklet are data on driving and properties of both types of sheeting as well as a method of figuring sizes and spacing of wales and struts.

Chronoflo Sequence Transmission

819

Builders-Providence, Inc., Providence, R.I., has issued a new 4-page bulletin on **"Chronoflo Sequence Transmission."** This bulletin illustrates the equipment and explains how the Chronoflo sequence transmission provides a method of transmitting multiple functions over a single pair of wires. Sequence transmission (the transmission of Chronoflo Telemeter signals on a time sampling basis) may be applied to recording and/or indicating, and/or totaling of a number of variables, such as flow rates, levels, temperatures, and pressures.

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SOUND PRINCIPLES OF WATER TANK MAINTENANCE and TANK TALK, by W. A. RILEY

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The bulletin also explains how these multiple functions may be transmitted, using a standard sequence cycle. Also explained in the new bulletin is the extension of this system so that transmission can be made in two directions, an improvement that permits of remote control and warning alarms.

A full page diagram shows a typical wiring diagram for Chronoflo Sequence Transmission for three telemetering channels, one control channel, and one indicating channel. A questionnaire for the telephone company is included to obtain data applying to leased circuits. The back page of the bulletin is devoted to questions and answers of particular interest to prospective users.

Hot Zeolite Process

820

Permutit Company, New York, N.Y., has just published a new bulletin on **Hot Zeolite** that includes the latest developments on the use of Permutit Hot Zeolite Process for the reduction to zero hardness of the effluent from hot lime soda softeners.

The bulletin states that the hot Zeolite process replaces second-stage phosphate treatment because of lower chemical costs, lower alkalinity and lower total solids in effluent, no need for acid feeding to prevent deposits in high stage heaters and economizers, and ease of operation.

Cut-away photographs show complete operating functions of the softener and a line drawing shows the complete installation of a two-stage hot process lime and Zeolite softener. A photograph of an actual installation and operating results of similar installations complete the bulletin.

Block Insulation Material

821

Johns-Manville, New York, N.Y., has published a new 4-page folder on **Superex Block Insulation.** This high temperature insulation is described on the cover as "The Standard of Industry for over 25 Years."

The inside spread tells the economic advantages of Superex and lists the outstanding properties of this insulation. This information is backed up with conductivity and heat loss graphs, as well as a recommended thickness table.

The back cover shows a few of the many special shapes in which Superex can be furnished, and photographs of the Asbestos and Lompoc mines to illustrate the sources of two important materials used in Superex manufacture.

Totally-Enclosed, Fan-Cooled Motors

822

Allis-Chalmers, Milwaukee, Wis., has just released a new bulletin describing types of construction and ratings of its improved **Totally-Enclosed, Fan-Cooled Motors** with tube-type, air-to-air heat exchangers.

Included in the bulletin is a small chart showing ratings of these motors available in squirrel-cage, wound-rotor and synchronous types for both horizontal and vertical installation, and a cross section view of horizontal motor construction features. Among these are capsule-type bearings, protected air intakes, and pipe-plug protected tapped holes for checking air gap with feeler gauges.

The bulletin points out that the totally-enclosed fan-cooled motors can, with minor mechanical modifications, be made explosion proof suitable for Class I, Group D service. These motors can be supplied with heat exchanger tubes, stator end

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TILE FILTER
BOTTOM

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plates, and external fan of stainless steel or other metals resistant to particular atmospheric acids or alkalies.

Aluminum Paint

823

Prufcoat Laboratories, Inc., Cambridge, Mass., has just published a technical bulletin entitled **"You Spend Less on Aluminum Paint When You Use Prufcoat Aluminum."**

The bulletin states that "Prufcoat" Aluminum is a ready-mixed, all-purpose paint for use inside or outside and is based on the same chemical-proof vehicle which has made "Prufcoat" the standard protective coating wherever corrosive conditions are exceptionally tough.

Six main advantages which users of Prufcoat Aluminum enjoy is discussed in detail in the bulletin.

Flooring Problems Analyzed

824

Stonhard Co., Philadelphia, Pa., has issued **"Over The Rough Spots,"** a new pocket-size, 32-page booklet which gives a searching analysis of flooring problems.

Requiring but 3 minutes to read and graphically illustrated, it tells where to look for and how to correct bad floor conditions. It tells how to protect both concrete and wood floorings and maintain proper repair by comparatively unskilled workmen.

Unique Heavy-Duty Couplings

825

Naylor Pipe Company, Chicago, Ill., has just issued an illustrated bulletin describing its **Heavy-Duty Wedge-Lock Couplings** for use on temporary or permanent pipe lines.

Speed and simplicity of connection are features, according to the description, and a hammer is the only tool required to connect or disconnect the coupling. Complete specifications on these one-piece positive type couplings are included in range of light-weight pipe sizes from 8 to 30 inches in diameter.

Lime in Treatment of Industrial Wastes and Sewage

826

The Finishing Lime Association of Ohio, Toledo, Ohio, has just published a 12-page booklet on **Lime—The Low-Cost Way To Prevent Stream Pollution.**

This booklet will be of interest to anyone concerned with the treatment of industrial waste and discusses in particular; things to be checked when installing a new treating plant; the treatment of pickling liquor; sludge reduction; plating wastes; and oil in water emulsions.

Flow charts on treatment plants are included along with charts covering comparative costs of alkaline chemicals and the cost ton basicity.

Protective Anti-Corrosion Tape

827

Minnesota Mining & Manufacturing Company, St. Paul, Minn., has published series of three bulletins on **Scotch Electrical Tape.**

The first two bulletins show how, when the tape is wrapped around pipe below or above ground, it precludes corrosive atmospheric or soil attack.

The third bulletin covers the use of this tape for protecting service pipes.

The tape is described as consisting of a polyvinal chloride film with pressure sensitive adhesive on one side. Advantages claimed are ease of application, fast, clean handling, low cost, elimination of danger to workmen from burns in handling hot

GATE OPERATORS — PORTABLE — FOR STANDS & UNDERGROUND GATES—MOTOR TRUCK MOUNTED
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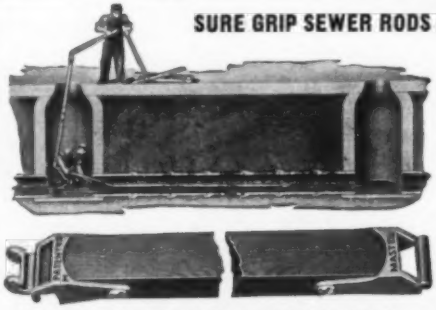
SURE GRIP SEWER RODS and ACCESSORIES



are joined together with a dual lock forming a rigid chain that will float. They can be coupled or uncoupled upon the street if desired. Made in two sizes.

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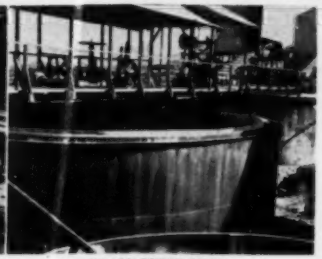

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1—45' x 12' Dorr, low head superstructure (see picture).
2—40' x 10' Denver, low head, 3 H. P. Motors.
3—40' x 10' Eimco, truss type superstructures, 3 H.P. Gearmotors (see picture).
2—20' x 10' Denver, low head, bolted steel tanks, spiral rakes, 2 H.P. motors.

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coating materials, and simple repair of pipe wrappings or coatings broken by rough handling of the pipe.

Ed. Note: We believe also that an exposed pipe wrapped with this insulating type of Scotch Tape can be made proof against sweating under all but the most extreme conditions.

Floor Resurfacing Material

828

Monroe Company, Inc., Cleveland, Ohio, has published a bulletin describing **Armor Resurfacing and Patching Material** for concrete floors.

The bulletin lists Armor features in detail and contains complete technical information. It also describes recent laboratory tests which indicate that Armor will withstand loads two to four times greater than standard cement. The material is said to resist acids, oil and moisture.

Couplings

829

Falk Corporation, Milwaukee, Wis., has announced the release of a bulletin on **Falk Steelflex Couplings.** The bulletin illustrates and describes the application of Falk speed reducers, couplings, gears and Motoreducers in specific industries.

All possible geared power transmission applications are shown with line drawings and photographs. Production men, engineers and maintenance men will find this bulletin a handy reference book.

Gravimetric (weighing) Feeder

830

Omega Machine Co., Providence, R.I., has announced a bulletin on its new **"Chemizer"—Belt Gravimetric (Weighing) Feeder.**

This bulletin describes the Model 50-8 for water and sewage works. Features presented and discussed in the bulletin include: Simple mechanical control, wide feeding range, positive non-flooding Rotolock, accuracy within 1 per cent, compact design, dust-tight housing, totalizer of register-type, and sentinel alarm bell.

The four-page bulletin shows a cutaway drawing of the "Chemizer" and its component parts (Neoprene weigh belt, scale assembly, patented wedge controller and variable speed transmission, hopper with agitators, and feeding mechanism with Rotolock.)

Line drawings show dimensions of the "Chemizer" and a typical installation diagram. Text matter covers description, operation, accuracy, and accessories.

Mixflo Pumps

831

Worthington Pump and Machinery Corp., Harrison, N.J., has just released a new bulletin on **Mixflo Pumps.**

The bulletin includes line drawings, photographs and dimensions of Mixflo types M, MA, MC, MD, and MDC. These are shown for pump

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BOND-O's exclusive machine blending process brings you the *one* flawless self-caulking jointing compound. The finest basic materials obtainable are so thoroughly blended by the BOND-O process—that you are assured of absolute uniformity of performance from every bag you buy.

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sizes from 20 to 84 and are used in sewage disposal, irrigation, drainage, condenser circulating and low head water supply.

Running-Time Recorder Bulletin

832

The Bristol Co., Waterbury, Conn., has published a new bulletin describing the new Series 500 **Running-Time Recorders.** This bulletin gives information concerning the application of the Running-Time Recorder to presses, factory machinery, refrigerators, pumps and motors, conveyors, continuous ovens, and furnaces. The bulletin is liberally illustrated with photos of various models, reproductions of chart records, and operation drawings. Photographs of several installations of the newly-announced instrument are also included.

Manual on Brush and Weed Control

833

Grasselli Chem. Dept. E. I. du Pont de Nemours & Co., Inc., Wilmington, Del. has published data on methods and results in **Chemical Brush and Weed Control,** as practiced by a wide range of industrial and agricultural organizations.

Included in the manual are records of the brush-control experience of telephone companies, power companies, railroads, gas pipe-line companies, highway departments, drainage and irrigation districts, a tree expert company and a soil conservation experiment station. In each case, methods of chemical control of undesirable growth which have been most satisfactory are presented, along with cost data and evaluations of short-term versus long-range control programs.

The new manual is profusely illustrated, showing "before and after" pictures of brush spraying operations. It is punched for insertion in standard three-hole loose-leaf notebooks.

Phoscote Process Bulletin

834

Chicago Bridge and Iron Company, Chicago 4, Ill., has announced the publication of a new 8-page booklet entitled **"The Phoscote Process"** which contains information on the pickling and painting of steel plates, angles, channels and other shapes produced by rolling.

The Phoscote process removes mill scale from steel plates and shapes by immersing the material in baths of sulphuric acid, wash water and phosphoric acid. The process provides a clean, dry surface with a coating of iron phosphate that improves the bond between the prime coat of paint and the steel.

The booklet contains photographs and drawings showing the various operations during the Phoscote process. Also, photographs of completed structures which have been built of plates and shapes treated by the Phoscote process.

Turbidity Measurements and Sulfate Determinations

835

Hellige, Inc., Long Island, N. Y. has published a new catalog featuring **"The Turbidimeter without Standards."** The instrument is designed for accurate measurements of water turbidity, sulfate determinations, and measurements of suspended matter and colloids in general, but is equally well adapted to many of the analytical tests commonly performed with a nephelometer. The bulletin describes how Hellige Turbidimeter eliminates tedious preparation and renewal of standard suspensions, use of long cumbersome tubes, and the difficulty of making readings with extinction-type apparatus. Detailed descriptions of the working principle and of the instrument itself are contained in the new catalog, together with prices of calibrated and uncalibrated Turbidimeters.

Operation and Maintenance of Chain Drives and Conveyors

836

Chain Belt Company, Milwaukee, Wis., has just published a new bulletin entitled **"Installation, Operation and Maintenance of Chain Drives and Conveyors."** The bulletin was designed to be of interest to all who design, install, maintain or operate chain drives and conveyors, and shows how to get the most service from your sprocket chains.

The text is short and to the point, and most of the illustrations show graphically the correct and incorrect ways of solving chain installation, operation and maintenance problems.

Laboratory Equipment for Water and Sewage Works

837

Central Scientific Co., Chicago, Ill., has prepared three lists of laboratory apparatus and chemicals for use in the

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chemical and bacteriological analysis of water and sewage. Two lists are based on the requirements as outlined in the **"Laboratory Manual for the Chemical Analysis of Water and Sewage"** by Eldridge and Theroux, List No. 2002 covers water testing equipment and list No. 2003, sewage testing. A third list, No. 2004, contains suggested equipment for the chemical and bacterial analysis of water and sewage following the book of similar title by Theroux, Eldridge and Mallman.

Selection and Maintenance of Porous Mediums

838

Norton Company, Worcester, Mass., has just published an attractive, 2-color, 20-page bulletin on **Norton Porous Mediums for Activated Sludge Sewerage Treatment Plants.**

The bulletin stresses the importance of selecting the proper porous medium for each installation and discusses, as a guide to selecting Alundum plates and tubes; characteristics, installation, specifications, cleaning, effects of temperature, representative installations, testing, shipping and the Norton advisory service.

By means of text, charts, drawings and photographs the permeability, porosity and pore size, wet pressure loss, uniformity, chemical stability, strength, heat resistance and installations of Alundum plates are thoroughly covered. Pages 12 through 15 give detailed information on cleaning Alundum plates and tubes in sewage disposal plants.

General Purpose Pumps

839

Peerless Pump Division, Food Machinery & Chemical Corp., Los Angeles, Calif., has just published a bulletin describing and illustrating **Peerless Fluidyne Pumps.**

The bulletin describes the pumps as of the horizontal, end-suction centrifugal type that may be driven by electric motors in sizes from ¼ to 150 hp. affording a capacity range of from 10 to 5500 g.p.m. and can be pumped against heads up to 260 feet.

Through the liberal use of photographs, charts and tables two types of pumps are offered. One is a close-coupled electric motor driven pump, designated as the Peerless Type PE. The other, designated as the Peerless Type PB, is a bracket-mounted pump for driving through a flexible coupling, V-belt, or flat-belt pulley.

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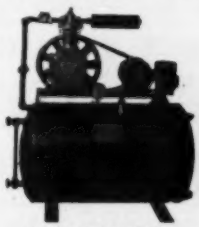

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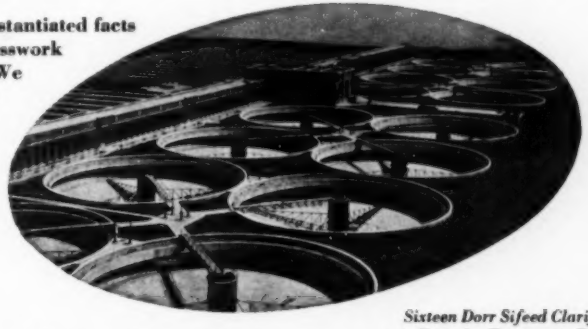

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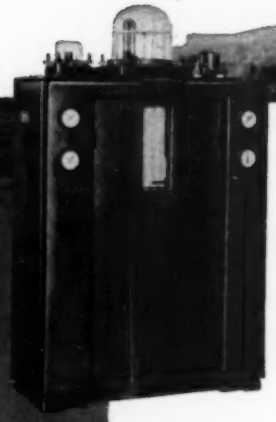

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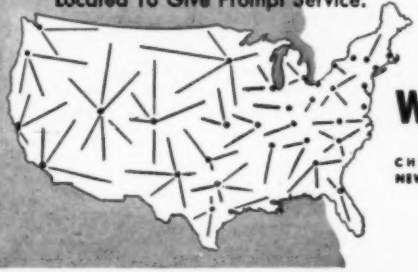

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